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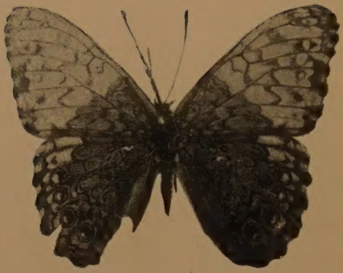

Fig. 1. Type of *Amphichlora poseidon* n. sp., from El Valle, Margarita Island, Venezuela.

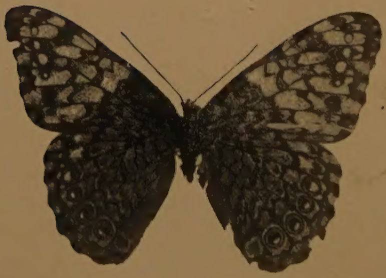

Fig. 2. *Amphiclora ferentina* Godt., from same locality, taken at same time.

PSYCHE

NOTES ON THE BUTTERFLIES OF MARGARITA ISLAND, CARACAS, AND CARUPANO, VENEZUELA.

BY AUSTIN H. CLARK, BOSTON, MASS.

In 'The Ibis' for January, 1895, Dr. P. L. Sclater suggested to ornithologists the advisability of turning their attention to the Island of Margarita as a field hitherto unworked. As a result of this notice, Captain Wirt Robinson, U. S. A., visited this locality in the summer of 1895, bringing back an extensive collection of the birds of the island, a number of insects, and some mammals. Unfortunately, the butterflies were subsequently lost; but on working up the mammals and birds, no less than thirteen new species were discovered, two of the former, and eleven of the latter.

Having determined to spend the summer of 1901 in zoölogical investigation in some little known part of South America, I communicated with Captain Robinson, with the result that I decided to visit this locality, and make a study of its fauna, as complete as time would allow, to form a sort of supplement to his work.

Accordingly, on the 15th. day of June, 1901, I left New York for La Guaira, en route for Margarita. At La Guaira I stayed a day and a half, leaving there for the more pleasant city of Caracas, to await the arrival of the steamer which was to take me to Carupano. During my stay of about a week at Caracas, I made daily excursions into the surrounding country for insects; but a combination of circumstances prevented my making any captures while at La Guaira. At Carupano also, while hunting up a small boat in which to make the journey across the channel, I could not spare any time for collecting, but on my way back I obtained a few specimens here.

Reaching Porlamar, on the southern shore of the island, on July 3rd., I at once proceeded to the little town of El Valle, situated about three miles from the sea, in a pleasant valley at the foot of the central mountain. This village is partially surrounded by groves of cocoanut palms, and is a very convenient place of residence, the climatic conditions being much more agreeable than in the towns nearer the coast, while it is easy of access both to the hot country near Porlamar, and the mountain forest. The region is peculiarly heathful, and too much cannot be said of its inhabitants, who seem to consider it an honor to assist the collector in every way. In this town I resided until July 25th., when circumstances compelled me to leave suddenly, much against my will, as my collections were as yet far from complete. During my stay, however, I secured specimens of all the butterflies observed, with the exception of a *Morpho*, an *Opsiphanes* (?), a *Papilio*, a *Urania*, and *Colaenis julia*; but I am confident that more extended researches, over parts of the island which I was unable to visit, will bring to light many additions to the following list, and it is much to be desired that sometime in the future, others, profiting by the experience of Captain Robinson and myself, will visit this interesting locality and make a much more exhaustive report on its entomological fauna.

The island of Margarita is situated midway between La Guaira and Trinidad, directly north of the town of Cumana, being about seventeen miles distant from the nearest point of the mainland. Its greatest length from east to west is forty-two miles. It consists of two portions, joined by a narrow swampy isthmus of about twelve miles in length, the eastern part being the larger, in the shape, roughly, of a pentagon, some twenty miles across, while the western is an irregular quadrangle, twelve miles long by nine in width. In the eastern part there is a mountain of 3,240 feet altitude, thickly wooded almost to the base; in the western another rises to the height of 2,300 feet, but is practically barren.* At the time of my visit the only way of reaching the island was to take a small trading vessel from Carupano or Cumana, which ports could be easily reached by the boats of the French or Dutch West India Mail. Now, however, the boats of the Royal Mail Steam Packet Company, plying fortnightly between Barbados and La Guaira call in at both Carupano and Porlamar, Margarita.

Margarita is divisible into three well defined life zones, as follows:

I. The almost flat costal plain, which extends all about the island occupying a strip averaging two or three miles in width, hot and sandy, supporting only a very scanty vegetation, which consists of post and melon cactus, with patches of "tuna,"** and scattering thorn-trees. I saw no butterflies whatever in this region; but among birds the burrowing owls *(Speotyto)* are exclusively found here, and the troupial *(Icterus)*, scaled Dove *(Scardafella)* Buzzard *(Buteo)*, and parrakeet *(Conurus)* prefer it to any other. Here also I found the trail of a rattle-snake *(Crotalus)* which appears to be quite rare, as all the natives assured me that they never had seen a snake on the island, and I found no trace of others in all my wanderings. The armadillo is reported to occur in this district.

II. The intermediate zone, consisting of a rough hilly country, with a large amount of scrubby growth, and many varieties of cacti, including also the cassava plantations. Here the specimens of *Apodemia* were taken, and a single *Urainia* was observed. The birds characterizing this region are the Spine-tail *(Synallaxis,)* the cuckoos *(Diplopterus)* and the honey creepers *(Coereba)*; while among mammals the rabbit *(Lepus)* is practically confined to it.

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* A map of the island was published in the Proceedings U. S. National Museum, XVIII, pl. XXXIII.

**A small, long-spined prickly pear, *Opuntia tuna*.

III. The forest region, including the whole of the mountain proper, and the valley in which the little town of El Valle is situated. This is, entomologically, divisible into three sub-regions, thus:

(a). The forest proper, including the greater part of the mountain. This, again is divisible into the drier portions, and the moist areas, in the immediate vicinity of water. Of the drier parts, the genus *Morpho* is the charactistic feature, which in the neighborhood of streams occur such forms as *Ithomia* and *Eurema albula*, and, in the lower portions, *Heliconius.*

(b). The intermediate forest region; where the little stream known as "El Rio," hardly more than a brook at the time of my visit, emerges from the thickly wooded area. This sub-region is the home of *Amphichlora poseidon* (see below), and in it *Heliconius melpomene* is found in greatest abundance.

(c). The valley region; consisting of cleared land with groves of cocoanut palms, interspersed with grassy patches, and the wooded borders of the river bed, which, at this season, is wholly without water. Here occur in abundance practially all the Pieridæ and Hesperidæ of the island, and such genera as *Eubagis*, *Agraulis*, *Lycaena*, *Euptychia*, *Mestra*, *Thecla*, *Anosia*, and *Amphichlora (ferentina).* It was in this region that I saw the only specimens of *Papilio*, *Colaenis*, and *Opsiphanes* observed.

The whole fauna of Margarita is derived, as is that of the island of Trinidad, from South America, no purely West Indian forms being present, so far as known, among the birds, mammals, fresh-water fishes, or Lepidoptera. In fact, among the birds there seems to be a regular migration between the island and the mainland in the case of certain species (as the parrakeet); and I have seen numbers of Pieridæ *(Aphrissa, Phoebis, Callidryas)* in the channel, midway between the island and the Venezuelan shore.

The summer of 1901 was very dry* on Margarita, due to the partial failure of the spring rains. This may in some degree account for the paucity of the lepidopterous fauna, as represented by my collection. But it is true, without doubt, that there are many species, either local or erratic in occurence, which cannot be obtained except by a long residence in the locality. Captain Robinson has sent me a partial list of the lepidoptera he collected here. It contains ten species, only two of which are represented in my lot, which brings out graphically the difficulty of obtaining a complete list of the butterflies and moths of any given locality in the tropics.

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*While in Barbados, in January, 1904, Mr. L. T. Spencer, F. R. G. S., who has lately spent considerable time on Margarita, informed me that water was now scarcer than ever; so much so indeed that the English pearl fisheries company at Porlamar were forced to depend on distilled sea water. The cutting down of the forests to build ships is without doubt the cause of this, as it is on the English West Indian island of Carriacou.

PAPILIONIDÆ.

Papilio thoas Linn.

On Margarita I saw a butterfly apparently referable to this common species, although much below the average size, which I was unable to capture, owing to the nature of the vegetation. Captain Robinson writes me that he collected here an undescribed dwarf variety of this insect.

PIERIDAE.

While approaching the coast of Venezuela, I saw large numbers of Pieridæ, flying over the water in small scattered groups. On the mountain sides above La Guaira I observed thousands of these insects, all moving, as were those over the water, toward the east. On the way from La Guaira to Caracas, as well as on the mountain slopes in the vicinity of the latter city, they could be counted by hundreds, all, without exception, moving toward the east.* It seemed to be a migration, which was following the line of the coast, and going in the general direction whence came the trade winds.**

Leptalis sp.

An undescribable species of this genus was collected by Captain Robinson on the island, but subsequently lost.

Pontia monuste Linn.

The most abundant butterfly on Margarita; it occurs in the cocoanut groves, and especially in the patches of rank grass about El Valle. The majority of the examples were in worn condition. In the early morning it is commonly found clinging to the grass-blades and leaves, where it is a conspicuous object.

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*Mr. W. E. Broadway, Curator of the Botanic Station at Grenada, B. W. I., who lived for many years in Trinidad and who is an enthusiastic entomologist, tells me that *Urainia leilus* visits Trinidad every year from the mainland, coming over by hundreds, its movements being apparently comparable to those here described as observed among the Pieridæ.

**For a more detailed account, see Canadian Entomologist, Aug., 1903, p. 219.

Callidryas eubule Linn.

Common on Margarita.

Aphrissa statira Cramer.

Common, but not so much so as *Callidryas eubule.*

Phoebis argante Fabr.

Common at El Valle, associating with *C. eubule* and *A. statira.*

Gonepteryx clorinde Godt.

Occurred about El Valle, but was not abundant.

Kricogonia lyside Godt.

Two examples, a male and a female, taken near El Valle.

Pyrisita proterpia Fabr.

Obtained by Captain Robinson.

Pyrisita gratiosa Doubl. & Hew.

Four specimens obtained near El Valle. They are all paler than that figured by Doubleday and Hewitson, and than others from Central America which I have examined.

Eurema limbia Felder.

Fairly common. The examples are smaller than Godman and Salvin's figure (Biol. Cent. Am., Rhopalocera pl. 63, fig. 13) and the black border of the secondaries is not so broad, being generally reduced to a series of black points.

Eurema albula Cramer;

Specimens from Margarita are rather more heavily bordered than those from Panama, and the tinge of sulphur at the base of the wings is more pronounced.

This species was abundant in the deep forest in the vicinity of the water courses, but did not occur on the lower slopes of the mountain, nor about El Valle.

Eurema lydia Felder.

One specimen obtained.

Eurema vitellina Felder.

Occurred about El Valle.

NYMPHALIDAE.

Colaenis julia Fabr.

Seen on two occasions near El Valle, but eluded capture.

Agraulis vanillae Linn.

With the exception of *Pontia monuste*, this was the commonest butterfly occuring most abundantly in the cocoanut groves, especially in the more shaded portions. In flight it closely resembles *Colaenis julia.*

Apodemia erostratus Doubl. & Hew.

Specimens from Margarita have the black markings less extensive than in those figured by Doubleday and Hewitson, and by Staudinger.

This butterfly was found on the scrubby hillsides about El Valle. It was often seen in the hottest places, where there was practically no vegetation. It is readily captured, resembling in its habits *Euphydryas phaeton.*

Mestra hypermnestra Hubn.

Very common in the cocoanut groves and about the roadsides near El Valle.

Junonia coenia Hubn.

Common in the cassava plantations, about the borders of the cocoanut groves, and in the hotter portions of the groves themselves.

Eunica monima Cramer.

One battered example secured.

Eubagis agacles Dalm.

Several specimens obtained about El Valle.

Eubagis theseus Felder.

Common in the cocoanut groves about El Valle, occuring with *E. agacles*, but more abundant than that species. The contrasting black and white of its wings make it a rather conspicious object, considering its size.

Amphichlora ferentina Godt. [Plate I. fig. 2.]

Common in the cocoanut groves about El Valle. When flying it occasionally produces the clicking sound so characteristic of the group, and it always alights head down. When alarmed, it seldom goes far, often only to the next tree. Its flight is, as a rule, low, rather swift, and in a straight line, reminding one of the flight of *Argynnis lathonia* or of *Euptoieta claudia*, but is more hurried than that of either of these.

Specimens from Margarita differ from the continental examples which I have examined in being uniformly smaller, with a greater amount of white in the ground color of the wings, particularly of the secondaries.

Amphichlora poseidon, new species. [Plate 1. fig. 1.]

Type locality, El Valle, Island of Margarita, Venezuela.
Expanse, 2.6 in.

General ground color of the secondaries and basal third of primaries, a uniform pale dusty bluish gray, with reflections of reddish bronze.

Primaries. Outside of a crenulate line beginning two-thirds of the distance from the base of the wings to the end of the cell, and extending in a direction almost at right angles to the costal margin to a point one-quarter of an inch from the outer edge of the wing, on the posterior border, chalky white, with a narrow line of gray in the cell near its distal extremity, and a wavy gray line parallel to the outer border of the wing, beginning a quarter of an inch from the distal end of its inferior margin, and extending to the vein passing from the middle of the distal end of the cell to the edge of the wing, then turning and running to the costal margin in a direction at right angles to it. The distal border of the primary is light gray, interrupted in seven places by white streaks, the sixth from the apex being almost as wide as the distance apart of the veins between which it occurs. Just inside this border is a row of five white spots, separated from the general ground color by irregular borders of light bluish gray. The first two of these spots are small, and are situated at the apex of the wing; the third, which is larger, is separated from the second by two veins. The fourth, which is the largest of all, is separated from the third by one vein, and the fifth, which is small, is one vein beyond the fourth. Midway between the two apical spots and the wavy line mentioned above, there is a patch of light gray, which extends as far as the second vein from the costal margin. The part of the wing proximal to the crenulate line before mentioned is bluish gray, with two brownish zigzag lines running parallel to the outer margin of the wing, from the cell to the inferior border. In the cell there is a faintly enclosed median spot, in the middle of which there is a tinge of rufous.

Secondaries. Ground color bluish gray, with a slightly darker border, separated off by a wavy line of brown. Inside of this border are four ocelli, the two anterior being rather smaller than the others, and having white centres bounded proximally by crescents of dark brown. The two posterior ocelli have a median transverse band of black, with a lunate spot of white in the distal, and a corresponding patch of rufous in the proximal half. Inside of the row of ocelli is an irregular line of brown. Inside this line there are a few spots separated off from the ground color by narrow dusky lines, as follows: in the cell, about one quarter of an inch from the proximal end there is a double spot, extending transversely across the cell, and anterior to this a small circular spot. Just distal to this series, is a row of four spots, the most anterior of brown, and close to the small circular spot just mentioned; the next gray, and just the size of the anterior circular spot of the series proximal to this; the third small, and wholly brown, and the last, which closes the cell, long and narrow, with a gray centre.

The under surface resembles that of *A. ferentina*, but the brown markings are narrower, the rufous centre of the spot which occupies the middle of the central cell on the primaries lighter, and the whole surface shows a more pronounced coppery reflection. The tips and under surface of the antennæ are light rufous.

This species is readily distinguished from *A. ferentina* by the great amount of white on the primaries, and its lighter bluish color, bronzy reflections, small size, and finer markings on the lower surface. The two are easily recognizable in life at a considerable distance.

From all others of the genus it is distinguished by the colors as described.

Messrs. Godman and Salvin mention (Biologia Centr. Amer. Rhopalocera p. 269) a peculiar specimen of *Ageronia glauconome* which was taken at Manaure in northern Colombia, in which the cretaceous white of the primaries is more extensive, and more broken up with the gray marks than in the normal form. They state further that "the discrepancies are in the direction of *A. ferentina*, and the specimen may prove to be an extreme form of that insect, or a new species." From this very meagre description, it would seem that the butterfly referred to was *A. poseidon;* but we cannot be entirely sure; however, it is very possible that this species will be found to occur in suitable localities throughout Venezuela and Colombia.

On Margarita, as has been mentioned above, *A. poseidon* is found in the damper spots on the border of the forest, and does not seem to frequent the open so much as does *A. ferentina*, prefering, as a rule, the same kind of situations as those in which *Peridromia amphinome* commonly is found.

Historis odius Fabr.

While on the beach at Carupano I saw what I was positive was an example of this species, coming in over the sea from the direction of Margarita. It passed within a few feet of me, but I was unable to secure it. Captain Robinson tells me he secured an "*Aganisthos*" on the island, which might possibly have been of this species.

AGAPETIDAE.

Euptychia phares Godt.

The commonest of the genus of Margarita, occurring abundantly in the cocoanut groves, especially in the more shaded portions underneath the mango or other thick trees. Godman and Salvin say that this species is nowhere abundant, though having a very extensive range.

Euptychia camerta Carmer (*sosybius* Fabr.)

One specimen obtained, in company with *E. phares.*

Euptychia ocirrhoe Fabr.

Two worn and faded examples obtained near El Valle.

Euptychia renata Cramer.

One specimen secured.

MORPHIDAE.

Morpho sp.

Examples of this genus were sometimes seen in the forest, but never except as one looked down over the tree tops from some elevation.

BRASSOLIDAE.

Opsiphanes sp.

While resting under a mango tree one day, my attention became fixed on a peculiar projection from the otherwise perfectly smooth trunk. Investigation showed it to be a butterfly of this genus, perched head downward. As I had no net at the time it escaped, and I did not find any others.

HELICONIDAE.

Heliconius melpomene Linn.

Abundant on the lower slopes of the mountain, in the vicinity of water, especially at the place where "El Rio" emerges from the forest. It often strays into the cocanut groves, and sometimes into the street of El Valle.

ITHOMIDAE.

Ithomia andromica Hew.

Common in the forest, in the immediate vicinity of streams.

Ithomia hippocrenis Bates.

One specimen obtained in the forest near "El Rio."

Ithomia sp.

Captain Robinson reports finding two additional species of this genus on Margarita.

LYMNADIDAE.

Anosia plexippus Linn.

Common in suitable localities, particularly about the butterfly weed (*Asclepias tuberosa*).

Anosia berenice strigosa Bates.

Common, with *A. plexippus.*

LYCAENIDAE.

Thecla argiva Hew.

One specimen from El Valle.

Thecla sp.

A medium sized species of this genus was taken at El Valle, but was so worn as to make identification impossible.

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DESCRIPTIONS OF SOME MOSQUITO LARVÆ, WITH NOTES ON THEIR HABITS.

BY JOHN B. SMITH AND JOHN A. GROSSBECK.

The larvæ here described are figured with structural details in a forthcoming report of the New Jersey Experiment Station, on the "Mosquito Investigations"; but as that report will appear later than was expected, it is deemed best to give a few notes with descriptions of heretofore undescribed larvæ in advance. The descriptions were drawn up by Mr. Grossbeck from office material; the notes and comments are by the senior author.

Culex squamiger Coq.

Larvæ of this species were first taken in April, 1903, by Mr. Grossbeck near Paterson, N. J., in woodland pools associated with *Culex canadensis.* They were recognized as distinct from any other that we had met with, but were not bred. May 2nd., of the following year Mr. Van Deursen, another assistant, brought in a lot of what were accepted as full grown *C. canadensis* larvæ, collected in the woods near New Brunswick, N. J. Pupation began May 3rd, and adults commenced to issue May 7. May 9, a male *squamiger* was found with the *canadensis*, and an examination of the breeding jar resulted in the discovery of one *squamiger* larva and its identification with the Paterson form. No other adults hatched from the pupæ. Another collection was made May 16, mostly pupæ of *canadensis*, but amongst them were some very large ones. From this lot 3 ♂ and 2 ♀ *squamiger* emerged May 17; 5 ♂ and 4 ♀ May 18, and 2 ♂, the last of the lot, on May 19. Other collections in the same locality were made at intervals throughout the season; but no more larvæ were found. This indicates a single brood; furthermore, adults were taken up to the middle of July, the late ones being so worn as to be almost unrecognizable.

The larva in general appearance resembles *Culex canadensis*; but is much larger, measuring 12–14 mm., in length, exclusive of the anal siphon. It is dirty gray in color, excepting the head and siphon. The head is almost as broad as long, widest immediately below the eyes, tapering without curve to beyond the base of the antenna, flattened in front, light brown in color, and with four small black spots near the base of the vertex. On the anterior part of the vertex are four apparently single hairs, each arising from separate pits; the pits so placed as to form a square, slightly narrower in front; directly opposite the posterior pair, at the base of each antenna, is a small tuft of 4 to 5 hairs. The antenna is rather short, curved, uniformly brown in color, the surface sparsely set with short, stout spines and with numerous small spinules scattered on the basal half. The tuft of 4 or 5 hairs is situated at the middle of the shaft and does not reach the tip of the antenna, which has the apex terminated with one long and one short spine, two short bristles and a short articulated peg. The eyes are of moderate size, semi-circular in outline with a small detached portion at the posterior edge. The rotary mouth brushes are thick, with the hairs in the more central part distinctly pectinated. The mentum is triangular in form, about as long as broad and with slightly curved series of from 12 to 14 small teeth on each side of the apex. The mandible is normal, set with small spines at its base. The maxillary palpus is short and very broad, with hairs and spines arranged in patches on the surface and with a comparatively small apical tuft; the basal joint rather large, with small stout spines at its apex.

The thorax is rounded, with rather short hair tufts issuing from slight angles at the sides. The anterior margin also with two short hair tufts.

The abdomen is long, the anterior two segments transversely oblong and with lateral tufts of 4 or 5 hairs; the central and posterior joints lengthened and narrower, with only two hairs to the lateral tuft up to segment 7. The eighth segment has lateral patches of from 28 to 34 scales, without any regular arrangement; the single scale has spines at the apex and along the sides, the apical one largest and longest, the others diminishing in size toward the base. The anal siphon is about four times as long as its width at the base, and has two series of toothed spines, each ranging from 17 to 22 in number. The spines are black, white tipped, with the teeth not quite reaching the middle; a common arrangement is for four teeth to form two pairs. The ninth segment is longer than wide, with a double dorsal tuft and ventral brush, the latter confined to the barred area. The dorsal chitinized saddle does not ring the segment. The tracheal gills are only a little longer than the ninth segment.

Culex niveitarsis Coq.

This species was first met with May 9th, on the Garret Mts., near Paterson. Only a single fully matured larva was taken; it occurred in a rocky pool with larvæ and pupæ of *Culex canadensis* and *sylvestris*, from which it was at once separated by its conspicuous rusty brown color and robust form. May 12, a new species—*niveitarsis* ♂—hatched from one of the pupæ; and it was recognized as theretofore undescribed, and the larva was put in alcohol. May 14, another collection was made, resulting in five specimens of the new species being found, together with larvæ and pupæ of *canadensis*, *sylvestris* and *Aedes fuscus*. Two of the larvæ were preserved in alcohol and the other three fell prey to some small Dytiscids which had been overlooked in bottom material. From the pupæ one ♀ *C. niveitarsis* emerged May 17. Later collecting in the same pool where they occurred failed to turn out any additional material of this species, and from this it appears that it also is a single brooded, early spring form.

The larva is a very stout, robust wriggler and measures 7–7.5 mm., in length to the end of the ninth segment. In color, it is grayish white, profusely mottled and shaded with brown. The head is about one and one half times as broad as long, and of a yellowish brown color. The posterior part of the vertex is maculated with a dark brown crescent shaped spot and a smaller one each side of it. Six hair tufts of 6 or 8 hairs each arise from the anterior part of the vertex, four in the central part and one at the base of each antenna. The antenna is of moderate length, pale yellowish, becoming brown at the apical third, the surface covered with rather large spines and many smaller ones intermingled; the apex with one long and three shorter spines besides a little joint. The tuft is situated on the shaft considerably below the middle and consists of 8 or 10 hairs. The rotary mouth brushes are deep orange in color, with the hairs of the central part pectinated at their tips. The mentum is triangular in form, twice as broad as high, with nine blunt teeth on each side of the apex. The maxillary palpus is normal, with a large apical tuft, a stout basal joint, and hairs over the surface arranged in rows and patches. The mandible is normal in form, peculiar by its very blunt teeth.

The thorax is rounded with slight lateral angles giving rise to moderate hair tufts; two very small tufts are also on the anterior margin. The dorsal surface is a little depressed and symmetrically blotched with brown. These markings differ as to shape, but always resemble two transverse bands, the anterior one broken in the middle.

The abdominal segments are thick and robust, each with lateral tufts of two hairs each, except the anterior two, which usually have 4 or 5 hairs. The eighth segment has a large patch of small scales on each side, about 45 in each patch, arranged in three or four irregular rows. The individual scale is rather long, broadest in the middle, with a small apical spine, and lateral ones becoming very small basally. The anal siphon is yellowish brown, about three and one half times as long as broad, with the lateral rows of spines extending half the length of the siphon from the base; the single spines broad at the base with one large tooth, or with one or two smaller ones beside the large tooth. The ninth segment is almost square, largely covered by the chitinized saddle; the double dorsal tuft and ventral brush moderate, the latter with two small tufts below the barred area. The anal gills are one and one half times as long as the ninth segment.

Culex siphonalis Grossbeck.

Four specimens of the larvæ were taken in a swampy woodland area, near New Brunswick, N. J., April 25, with *Culex canadensis* and *Corethra cinctipes* They were recognized as new to us by the unusually long and tapering anal siphon, and were put in a separate jar to breed; they did not do well in confinement and May 7, two died, so the other two were put in alcohol. April 27, twenty specimens, all rather well grown were brought in, and on May 2, as many more. They were comparatively rare, and difficult to secure, seldom rising to the surface and inhabiting only the deep pools.

The larva measures 9-11 mm., in length excluding the anal siphon and is not robust in appearance. The body is light gray or yellowish brown in color, with the thorax somewhat darker. The head is about one and one half times as broad as long, yellowish to light brown, though the vertex is often clouded so as to give the appearance of a dark brown head. The posterior part of the vertex is marked by four spots and a semi-circular blotch, which are often obscured by the clouds. Four tufts of two hairs each are situated on the top of the head in the anterior part and a larger tuft is at the base of each antenna. The antenna is moderately long, somewhat sharply curved, the surface sparingly set with spines, rather thickly at the base, and with three or four regular rows of minute spines from the base toward the apex on the inner side. The tuft is well below the middle and consists of but two or three hairs. In color the antenna is brown, very dark toward the tip, the apex with three spines of different lengths, a very short spine and a small joint. The eyes are large and black and the rotary mouth brushes are pectinated in the central hairs. The mentum has slightly curved edges of 11 or 12 teeth on each side of the apical one and becomes very broad at the base. The mandible is normal, with a group of small spines at the base. The maxillary palpus is set with spines and patches of hairs over the surface and has a chunky little joint at its base.

The thorax is as long as broad, only slightly angulated at the sides, the lateral tufts moderately long and, in addition, there are two very small tufts on the anterior margin.

The abdominal segments from 1 to 7 are oblong or sub-quadrate in form, with three or more hairs to the lateral tuft in the first and second segments, two hairs to the tuft in the following segments. The eighth segment has from 24 to 30 scales to each of the lateral patches; the single scales long, with three spines at the apex, the central one very long and very fine ones along the sides.

The anal siphon is pale yellow in color, slightly darker near the tip, very long, being about five times as long as its width at the base and evenly tapered toward the apex. The spines, from 15 to 22 in each row, extend almost to the middle: they vary in size and in the number and length of the teeth; the short ones always toward the base; the apical two separated from the rest and from each other. The siphonal tufts at the end of the rows have but three or four long hairs. The ninth segment is slightly longer than broad with the usual dorsal and ventral tufts, the latter with several small tufts below the barred area. The anal gills are stout and moderate in length without visible tracheæ. The larva differs obviously from that of *cantans* in the antennal structure, in the form and arrangement of the scales on the eighth segment and in the form and armature of the anal siphon.

Culex pretans Grossbeck.

The connection between the larva here described and the adult is not positively made, but there seems little doubt as to the correctness of the association. A mixture of full grown larvæ and pupæ was collected from woodland pools in the Great Piece Meadows, May 10, 1904. The larvæ were put in alcohol and the pupæ left to develop. On May 12, 1 ♂ and 1 ♀ *Culex pretans*, together with specimens of *canadensis* and *sylvestris* emerged from the pupæ. The alcoholic larvæ were examined at once and were found to be *canadensis*, *sylvestris*, *Aedes fuscus* and four larvæ which were new to us, and as we had the larvæ of all other New Jersey species thus far known, excepting *perturbans*, we thought it quite safe to associate them with *pretans*.

The larvæ are from 5.5-6mm. in length to the end of the ninth segment and are pale to dark gray in color. The head is one and one half times as broad as long, yellowish, with a large brown blotch in the anterior part of the vertex, similar to *C. sylvestris*. There are four hair tufts of 4 or 5 hairs each in the center of the vertex and a larger one at the base of each antenna. The antenna is rather short, slightly curved, pale yellow in color, faintly infuscated apically, thickest a short distance from the base and has the surface sparsely set with stout spines and numerous small ones arranged in longitudinal rows. The tuft is situated well below the middle and consists of 8 or 10 hairs which do not reach the apex; the apex with one long spine, several smaller ones and a small joint. The rotary mouth brushes are dense, with the hairs of the central part pectinated. The mentum is triangular in form, with 15 to 17 small teeth on each side of the apex. The mandible and maxillary palpus are normal, the latter with a moderate apical tuft and stout basal joint.

The thorax is very much broader than long, with angulated sides, each angle set with acute infuscated tubercles from which issue moderate sized hair tufts and there are two very small tufts near the anterior margin.

The abdominal segments are subequal, each bearing lateral hair tufts of from 2 to 5 hairs each, the larger number on the anterior segments. The lateral patches of scales on the eighth segment are large, having from 25 to 30 scales in each patch. The individual scale is elongated, with a rather small apical spine and smaller ones fringing the sides. The anal siphon is two and one half times, or slightly over, as long as broad, yellowish brown in color, thickest near the base and tapering a little apically. There are from 16 to 20 spines in each of the rows, the single spine with one or two teeth near the base. The ninth segment is almost square, nearly ringed by the chitinized saddle, and with the double dorsal tuft and ventral brush normal and moderate in size, the latter with several small tufts below the barred area. The tracheal gills are slender, about two and one half times the length of the ninth segment and taper to a point.

Culex inconspicuus Grossbeck.

Larvæ of this species were taken with *C. sylvestris* on the Garret Mts., near Paterson, N. J., Sept. 29, 1903. They began to die off in the breeding jar before it was known that we had a new larva to deal with. Then, only *sylvestris* were left alive but remnants in the bottom of the jar were placed in alcohol. In these remnants only the more strongly chitinized parts of the larvæ remained, the anal siphon and the head case. The antennal attachments seem to offer but little resistance to decomposition: only one had retained them and these were in such condition as not to allow a description to be drawn.

From the pupæ in the jar, adult *C. inconspicuus*, emerged as follows: 1 ♂, Oct. 4; 1 ♂ and 1 ♀, Oct. 5; and 1 ♂, Oct. 6.

The larva presents a general resemblance to *C. sylvestris*, but is much smaller. The mandibles and maxillary palpi are also similar to that species, but the sides of the mentum are more rounded and have fewer teeth,—10 or 12 on each side of the apex. The hairs of the rotary mouth brushes are pectinated. The antennæ as well as could be seen were very much like those of *C. sylvestris*. The anal siphon is about three times as long as broad with 16 to 22 spines in each of the lateral rows; the individual spines are rather slender, and with one or two teeth near the middle, but in one larva the spines were stouter and had as many as four teeth on one spine. The lateral patches are large, each with about 40 to 45 scales, the single scale with long slender apical spines and shorter lateral ones. The ninth segment is as broad as long, not quite ringed by the saddle and with the dorsal tuft and ventral brush moderate in size, the latter with small tufts below the barred area. None of the specimens retained the tracheal gills.

SOME BAHAMA ORTHOPTERA

BY ALBERT P. MORSE, WELLESLEY, MASS.

In the summer of 1904 Dr. Glover M. Allen of the Boston Society of Natural History, and Messrs. Thomas Barbour and Owen Bryant of Harvard University spent several weeks in a zoölogical collecting trip to the northern Bahamas. The orthoptera secured, including some apparently undescribed species, form the subject of the present paper, in which are incorporated several notes by Dr. Allen on the habits of some of the species observed by him. This is the sixth of a series of short papers based on the material collected.

BLATTIDAE.

1. *Ischnoptera blattoides* Sauss. Mangrove Cay, Andros, O. Bryant.
2. *Eurycotis* sp. indet. Mangrove Cay, Andros, O. Bryant.
3. *Periplaneta americana* Linn. New Providence; Mangrove Cay, Andros, O. Bryant.
4. *Periplaneta australasiae* Fabr. New Providence; Mangrove Cay, Andros, O. Bryant.
5. *Rhyparobia maderae* Fabr. Exact locality not given.
6. *Pycnoscelus surinamensis* Linn. New Providence.
7. *Hemiblabera* sp. indet. Mangrove Cay, Andros, O. Bryant.

ACRIDIIDAE.

8. *Orphulella olivacea* Morse. 1 ♂, Stranger Cay, July 14, G. M. Allen. "Fairly common back from the shore along the upper beach."
9. *Amblytropidia?* 1 juv., Nassau, June 28, G. M. Allen.
10. Tryxaline, indet. 1 juv., Nassau, June 28, G. M. Allen.
11. *Schistocerca americana* Drury. 2 ♂ 1 ♀, juv. 3, 5, Nassau, June 28, G. M. Allen; 1 ♂, Elbow Cay, July 3; 1 ♀, Mangrove Cay, Andros, Aug. 1 to 7, O. Bryant; 1 ♂, Stranger Cay, July 14, G. M. Allen.

    "Common at Nassau in the gardens near the hotel. They were also very common at Stranger Cay, where on July 14 and 15 we saw numbers along the edge of the bushes on the upper part of the beach."
12. *Schistocerca* sp. 2, juv. 2, 4, Nassau, June 28, G. M. Allen; pale fulvous in color.
13. *Schistocerca* sp. 1, juv. 3, Nassau, June 28, G. M. Allen; 2, juv. 4, 5, Mangrove Cay, Andros, Aug. 4, O. Bryant; 1 juv. 2, Stranger Cay, July 14, G. M. Allen; color green or yellowish green.

14. **Paroxya dissimilis** sp. nov.

Resembling *P. atlantica* in size and appearance but differing markedly in form of male genitalia. The cerci are nearly three times as long as their basal width, slender, narrowing rapidly in their basal half to less than one-third their basal width, approximately equal in middle third, slightly dilated apically (chiefly on dorsal margin) the ventral margin straight except at base, the dorsal margin sinuous, the apex truncate, slightly more than half as wide as base, its dorsal angle rounded; the whole organ is moderately and regularly incurved, its apex flattened externally, convex internally, with revolute margins. Furcula similar to that of *atlantica* but shorter and the tips less pronounced.

Antennæ (estimated) ♂, 10, ♀, 8; body: ♂, 18.2, ♀, 20.5; hind fem.: ♂, 11.5, ♀, 13.7; tegmina: ♂, 14, ♀, 16 mm.

One ♂, one ♀, Mangrove Cay, Andros, Aug. 4, O. Bryant.

14 a. *Paroxya* sp. juv. 2, 4, 5. Stranger Cay, July 14, G. M. Allen.
Very likely identical with the preceding.

LOCUSTIDAE.

15. *Conocephalus nietoi* Sauss. 1 ♀, juv. 4. Nassau, June 28, G. M. Allen.

16. *Conocephalus* sp. 4 specimens, juv. 1, 2, Nassau, June 28, G. M. Allen; vertex acuminate.

17. *Xiphidium fasciatum* DeG. 1 ♂, 1 ♀, Nassau, June 28, G. M. Allen. In the ♂ the wings barely pass the hind knees, in the ♀ they extend 6mm. beyond them. Mr. Allen states that the green grasshoppers taken at Nassau "were collected among the grass on the estate of Mr. Robert Johnstone. Most of the grass in the Bahamas is confined to such places as have been cleared and cultivated."

18. **Xiphidium insulare** sp. nov.

This is a slender species related to *X. gracillimum* but with the vertex wider (at least one-third the distance between the eyes), and less produced (five-sixths the length of eye viewed from above), the hind femora proportionally shorter, and the lateral lobes of the pronotum distinctly polygonal in outline instead of triangular.

Body: 11; tegmina: 15; wings: 18; hind femora: 10; total length (vertex to end of wings): 22 mm.

1 ♂, Stranger Cay, July 14, G. M. Allen.

Three additional specimens of this genus in early stages were secured, two at Nassau,, and one on Mangrove Cay.

GRYLLIDAE.

19. **Mogisoplistus barbouri** sp. nov.

A larger and stouter species than *slossoni* of Florida, with the auditory foramina elliptic, twice as long as wide (in *slossoni* circular). Pronotum quadrate, narrowed anteriorly, strongly convex transversely, the front and hind margins truncate, the sides barely convex. Hind femora stout, about two-fifths as wide as long. Body and legs clothed with white scales. Hind legs with lower margin of femora, edge of tibiae, and sides of metatarsus with delicate white or brownish pile, the under side of the metatarsus and its spurs covered with a dense brush of brown pile. Anterior and middle legs pilose, and with numerous additional long, slender, scattered hairs, attaining a length on the femur of half its diameter, on the tibia equalling its diameter. Ovipositor rather stout, barely lanceolate at tip.

Body: 10; hind fem.: 2.3x6; hind tib.: 4.5; ovipositor: 5; antenna: 13 +; pronotum: ant. margin, 1.8, post. margin, 2.7, length, 2.4 mm.

One ♀, Nassau, July, T. Barbour.

20. *Cycloptilus americanus* Sauss. 1 ♂, 1 ♀, Nassau, G. M. Allen.

21. *Nemobius* sp. 1 juv. ♂, Nassau, June 28, G. M. Allen.

22. **Nemobius alleni** sp. nov.

Body short, stout, somewhat depressed; antennæ extremely slender, two and a half to three times as long as the body. Beneath brown; above, fuscous, finely maculate with brown. Hind femora with three transverse fuscous fasciae on apical three-fifths, at base brown with numerous narrow, oblique fuscous stripes. Bristles of head, pronotum and legs black; pubescence of body, legs and cerci brown.

Spines of hind tibiae three in number on each side, forming a graduated series with the longest apical spur (which equals the metatarsus) and densely pubescent, the hairs on the ventral side extremely long. Auditory foramina of male linear, of female lanceolate, the apex distal. Tegmina of male covering two-thirds of abdomen, nearly as wide as long, black, indistinctly varied with brown; truncate, the speculum and apical area aborted. Female completely apterous. Ovipositor moderately stout, compressed, gently but distinctly arcuate, shorter than hind femora, the tip slightly lanceolate, minutely denticulate on its dorsal margin; cerci equalling ovipositor, slender, villose, the hairs at base one-third as long as cercus.

Body: ♂, 5 to 6; ♀, 6; hind fem.: ♂, 4.5; ♀, 5; ovipositor: 4; antenna: ♂, ♀, (estimated) 15 mm.

Two ♂, 2 ♀, Moraine Cay, July 13, G. M. Allen. 4 ♂ and 3 ♀ nymphs in the fourth and fifth stages were also secured.

This interesting little cricket, which was collected by Dr. Allen, for whom I take pleasure in naming it, was "found abundantly along the edge of a mangrove swamp that extended for some distance out from the shore. On approaching this swamp from the landward side my attention was attracted by a faint but continuous cricket-like note which seemed to come from all about me. After a careful search among the black roots of the mangroves and the water-soaked leaves at their bases, I found numbers of the little insects. They were extremely quick and agile, and although it was easy enough to see them as they leaped aside at my approach, they immediately became invisible on alighting, so closely did they harmonize in color with the dark sticks and leaves. In this thick undergrowth the use of a net was practically out of the question, even if I could have been quick enough to sweep up the active little creatures. I found, however, that I could easily drive two or three at a time on to a sheet of newspaper that I spread on the sodden surface of the swamp, and with a slow but steady motion a wide-mouthed bottle could be brought above a resting insect and clapped over him before he could escape."

23. **Gryllus bryanti** sp. nov. With the general facies of *G. firmus*.

Head black with faint brownish markings. Pronotum one and a half times as wide as long, black, with narrow, irregular, poorly defined, yellowish-brown markings along the posterior half of the lateral carinæ, anterior half of median line, and anterior and posterior margins. Tegmina black, the veins and venules of the lateral field luteous, entirely covering body, reaching hind knees. Wings fully developed, extending nearly to the end of the hind tibiæ. Legs brownish fuscous, the hind tibiæ with 6 or 7 spines on each side, not widely divaricated; the upper and middle calcaria of equal length, less than one-half the metatarsus (in *firmus* one-half to three-fifths), the longest metatarsal spur reaching less than half way down the last tarsal joint (in *firmus* extending one-half or two-thirds its length.) Ovipositor slender, shorter than body, about one and one quarter times as long as the hind femora.

Body: 22; pronotum: length, 4, width, 6; tegmina: 16; wings: 26; hind fem.: 14; ovipositor: 18 mm.

One ♀, Mangrove Cay, Andros, Aug. 4, O. Bryant.

24. *Cyrtoxipha* sp. indet. One ♀, badly damaged, Nassau, G. M. Allen.

25. *Amphiacustes annulipes* Serv. 1 juv. ♂, Nassau, June 28, G. M. Allen.

26. **Amphiacustes bahamensis** sp. nov.

Related to *annulipes* and *fuscicornis*. Antennæ of great length and extreme tenuity, seven to eight times as long as the body in the male. Vertex strongly depressed at the level of the middle of the eyes. Pronotum once and a half (♀) or twice (♂) as wide as long, its lateral lobes with the ventral margins strongly oblique, the angles broadly rounded. Female apterous. Tegmina of male covering two-thirds to five-sixths of the abdomen, reddish brown, the veins pale yellow; speculum symmetrical, equaling one-third of a circle, arcuate behind, obtuse-angulate (120°) in front, crossed by two dividing venules, the posterior arising midway of the posterior border and curving forward to join it again near the external angle, the anterior arising a little nearer the internal angle than the origin of the first and crossing the speculum by a course at first straight and then for a short distance arcuate to strike the external border at or just behind the external angle. Post-anal vein angulate in the middle, and sending a venule from the angle to the anterior angle of the speculum with whose antero-external border it is continuous save for an almost imperceptible truncation due to the junction of the diagonal vein. Oblique veins 3 or 4, the first two sinuous.

Supra-anal plate of male truncate, its lateral margins sinuate, somewhat revolute, sometimes prolonged at the posterior angles into projecting, vertically placed, flattened processes.

Body dark reddish brown above, pale brown or luteous beneath. Anterior and posterior margins of pronotum and a line behind posterior margin of eyes pale yellow; a transverse poorly defined band on the vertex and another on the anterior third of the pronotum yellowish brown. Legs longer and a little slenderer than in *annulipes*, pale brown and luteous, the hind thighs rusty at base and fuscous along ventral sulcus; the fore and middle thighs not annulate with fuscous as in *annulipes* but all joints sometimes sparsely marked apically with dark brown.

Antennæ: ♂, 115-120; body: ♂, ♀, 16.5-17; pronotum: ♂, 3x5.5-6, ♀, 4x6; tegmina: ♂, 6x8.5: ant. fem.: ♂, 10-11, ♀, 10.5; middle fem.: ♂, 11-12, ♀, 11; post. fem.: ♂, 20-23, ♀, 21; post tibiæ: ♂, 21-25, ♀, 23; ovipositor: 16mm.

Three ♂, one ♀, Mangrove Cay, Andros, Aug. 4, O. Bryant. Three ♀ nymphs in the fifth stage and one in the first were also secured.

Dr. Allen writes concerning the crickets of this genus that they "were on several occasions found in numbers just within the entrance of some rather open caves in the limestone rock both at New Providence and on the Abacos. They were crawling about on the roofs of the caves and seemed to avoid the floor. Mr. Barbour caught two or three at Nassau about some large trees towards evening. The note of these crickets is a rasping 'scre-e-e-e-p' with an upward inflection."

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LVIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Mesoleuca vasiliata Guenée.

Egg. Elliptical, rounded, normal, the depression marked; all rounded, no flat areas; evenly reticulate with broad low lines, hexagonal, finely punctate shagreened all over. Pale waxy yellow; size .9 x .6 x .5 mm.

Stage I. Head rounded, whitish testaceous, eye black, mouth brown. Body thin and slender but not rapid in motion, becoming rigid erect when disturbed; white, the ends (joints 2–4, 10–13) yellowish tinged in certain lights from their retraction. No marks; no shields; tubercles concolorous, obscure; setae stiff, pale, rather conspicuous.

Stage II. Head rounded bilobed, the apex of clypeus depressed, shining light yellow, ocelli black; width .5 mm. Body slender, rather elongate, normal, coarsely annulate. Setae rather-coarse, white; no shields; tubercles invisible; no marks, food green.

Stage III. Head round, bilobed, free, lobes full, shining ochraceous luteous, clypeus depressed, ocelli black; width .8 mm. Body moderate, green from the food, unmarked, the folded incisures whitish; tubercles a little elevated, round, shining, colorless; feet pale; no shields; setae short, pale; subventral fold prominent.

Stage IV. Head rounded, shining, caramel luteous, setae brown, ocelli black; width 1.1 mm. Body cylindrical, slender, the central segments well elongated. Translucent green, incisures narrowly folded, yellowish; tubercles small, round, white, elevated, distinct. The dorsal vessel shows darker and the tracheal line white by transparency. No marks; no shields; thoracic feet brown. About joint 9 a broad stigmatal band begins and runs to the anal feet. It is also slightly indicated on thorax. Setae moderate.

Stage V. Head long, bilobed, green, shagreened, the lobes full, pale greenish, the epistoma, and antennae whitish with a short white band before the eyes; width 1.7 mm. Body moderate, elongate, cylindrical, the segments wrinkly annulate, anal feet large, projected outwardly. Green, anal feet and dorsum of joint 13 shaded in vinous; tubercles elevated, rounded, white like small buttons. Very faint longitudial white washed lines; dorsal vessel dark green; setae moderately long, distinct. Later the head acquired a red flush over the lobes.

Food plant thimbleberry (*Rubus nutkanus*); the hatched larvae ate this plant and a wild larva was found on it. Larvae from Kaslo, British Columbia.

RECENT ENTOMOLOGICAL LITERATURE.

MOSQUITOES OR CULICIDAE OF NEW YORK STATE: BY E. P. FELT, STATE ENTOMOLOGIST.

(BULLETIN 79, N. Y. STATE MUSEUM, 1904). The great interest taken in the *Culicidae* by the leading entomologists of the country is most gratifying, and their method of procedure highly commendable, viz: first working out thoroughly the life history of the various species, so as to be able to combat them in the most practicable manner.

It is really surprising the number of new forms which have been discovered since the crusade on the mosquito began. Less than twenty-five years ago the number recorded from North America was 33, and it is only about four years since 24 was the number given for the United States.

This work of about 160 pages and 57 plates, is one of the most important publications on the *Culicidae* that have appeared since Theobald's monograph. An interesting introduction treating of mosquitoes as carriers of disease, their distribution, life history, natural enemies, etc., is followed by description of species supplemented by keys to the genera and species, covering adults and larvae. The work is profusely illustrated by 113 excellent figures in the text, and by 57 plates containing over 200 figures, reproduced from the author's photomicrographs of balsam mounts prepared by D. B. Young. These reproductions are exceedingly fine, especially those of the genitalia, wings, and portions of wings greatly enlarged to show the form of the scales.

The following new species are described: *Culex absobrinus*, *C. magnipennis*, *Corethra karnerensis*, *C. lintneri*, *Sayomyia rotundifolia*, *S. hudsoni* and *Culex abfitchii*, the latter based only on the larvae. The main portion of the work closes with a very complete bibliography of the *Culicidae*, commencing with the year 1847. There is given in an appendix (pages 391a to 391f), "A generic revision of the *Culicidae*," in which are proposed the following new genera: *Culicelsa*, type *taeniorhynchus* Wied.; *Culicada*, type *canadensis* Theo., *Ecculex*, type *sylvestris* Theo.; *Culiseta*, type *absobrinus* Felt; and *Protoculex*, type *serratus* Theo.

C. W. J.

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Asterisks indicate descriptions of new species of American insects or of new genera.

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68	Science, New York City.
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160	Popular Science Monthly, New York City.
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166	Il Naturalista Siciliano, Palermo.
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Silvestri, F. Contribuzione alla conosenza dei Termitidi e Termitofili della America meridionale, 167 i, pp. 1–234, 6 plates. **Wheeler, W. M.** The Phylogeny of the Termites, 140 Dec.

ORTHOPTERA.

Caudell, A. N. Orthoptera from Southwestern Texas,* 165 i, No. 4. [Five new species and one new genus, *Hoplolibethra*]. **Riley, W. A.** The Embryological Development of the Skeleton of the Head of *Blatta,* 3 Nov.–Dec. **Vuillemin, P.** La Mante religieuse dans la vallée de la Meuse, 65 Dec.

PHYSOPODA.

Ashmead, W. H. A new Thrips from the Philippine Islands, 5 Jan.

HEMIPTERA.

Breddin, G. Noch einiges über *Colobasiastes* Bredd.*, 38 xxiii, 245. **Bueno, J. R. de la Torre,** Notes on *Hydrometra martini* Kirk., 4 Jan. **Fisher, G. E.** The Pear-tree Psylla and how to deal with it, 4 Jan. **Sherman, F., Jr.** The Flat-bugs *(Aradidae)* of North Carolina, 5 Jan.

TRICHOPTERA.

Ulmer, G. Uber westafrikansche Trichopteren*, 22 xxviii, 353. [New genus *Hyalopsyche*].

LEPIDOPTERA.

Brues, C. T. The occurrence of a tropical butterfly in the United States [*Eubargis dionis* Hbn.], 5 Jan. **Cuenot, L.** Y a-t-il une relation entre le sexe et la taille des oeufs chez les lépidoptères? 73 4e série, tome iii, No. 2. **Daecke, E.** Notes on *Prionapteryx nebulifera* Steph., 5 Jan. **Fernald, C. H.** A new species of North American *Proteoteras**, 4 Jan. **Kearfott, W. D.** (a) A new Gelechid from Ontario*, 4 Jan.; (b) New Tortricids*, 4 Jan. **Lyman, H. H.** Further notes on types, etc., in the British Museum, 4 Jan. **Nason, W. A.** Micro-lepidoptera of Algonquin, Illinois, 5 Jan. **Ragusa, E.** Note lepidopterologiche (con tavola), 166 xvii, No. 5. [Figures *Satyrus semele* ab. *triocellatus* Ragusa and *Epinephele lycaon* ab. ♂ *biocellatus* Ragusa]. **Williams, F. X.** The larva of *Hepialus sequoiolus* Behrens, 5 Jan. **Wolley Dodd, F. H.** List of Macro-lepidoptera of Alberta, cont., 4 Jan.

DIPTERA.

Czerny, P. L. Revision der Helomyziden*, 38 xxiii, 199. [The genus *Gymnomyza* Strobl being preoccupied, *Actenoptera* is proposed in its stead. Two other new genera, *Blaesochaetophora* and *Eurygnathomyia* are proposed. Three other species are described]. **Meunier, F.** Contribution à la faune des *Helomyzinae* de l'ambre de la Baltique, 65 Dec. **Portevin, G.** Contribution au Catalogue des Diptères de Normandie (suite), 65 Jan. **Smith, J. B.** How does *Anopheles* bite? 68 Jan. 13.

See also Smith, under Economic Entomology.

COLEOPTERA.

Fleischer, Dr. A. *Liodes (Trichosphaerula* m.) *scita* Er., 38 xxiii, 261. [A new subgenus]. **Ragusa, E.** Catologa ragionato dei coleotteri di Sicilia (cont.), 166 xvii No. 5. **Vitale, F.** Osservazioni su alcune specie di Rincofori Messinesi, Nota II (cont.), 166 xvii, No. 5.

HYMENOPTERA.

Ashmead, W. H. New Hymenoptera from the Philippine Islands*, 4 Jan. New genera *Apterencyrtus* and *Brownius*]. **Bradley, J. C.** *Ropronia*, an anomalous hymenopteron*, 5 Jan. [One new species, *ashmeadii*]. **Cockerell, T. D. A.** Some American Hymenoptera, 5 Jan. **Ducke, A.** Revisione dei Crisididi dello stato Brasiliano del Para, 69 xxxvi, 13. **Enderlein, Dr. G.** Die Braconiden—subfamilie *Mimagathidinae**, 22 xxviii, 449. [A new subfamily, and a new genus, *Mimagathis*]. **Fielde, A. M., and Parker, G. H.** The Reactions of Ants to Material Vibrations, 1 Sept. **Marchal, P.** Recherches sur la biologie et le développment des hymenoptères parasites: I. La polyembryonie spécifique ou germinogonie, 73 4e série, tome ii No. 3. **Sanderson, E. D.** The Kelep and the Cotton Plant, 68 Dec.

THE NOVEMBER EXHIBITION.

A public exhibition of insects was held by the Cambridge Entomological Club on November 16, 17, 18 and 19, in the rooms of the Appalachian Mountain Club on the tenth floor of the Tremont Building. The number of visitors, estimated at 350, gave evidence of a growing interest in entomology among the people of Boston and its vicinity. Collections were shown illustrating Variation, Protective Coloration, Hybridity and other phenomena of insect life.

Only a brief mention of each exhibit can be made here. Mr. W. D. Denton entered a fine display of lepidoptera mounted in tablets. Mr. C. V. Blackburn's remarkable collection of moths obtained about two electric lights in the city of Woburn, in a single season, attracted much attention. Miss Soule's hybrid lepidoptera and Mr. F. H. Foster's bred series of Haploas were extremely interesting. Mr. W. F. Low's exhibit was one of the most extensive shown, and embraced, in addition to a fine series of hybrid moths, some remarkable aberrant examples of *cecropia* and *promethea*. Mr. Johnson showed a fine collection of Hymenoptera with Dipterous mimics. Mr. Hayward's exhibit was a carefully-prepared synoptic collection of the families of Coleoptera, with explanatory labels. Mr. A. C. Sampson's display included the five-winged *cecropia* figured in the December Psyche, and a collection of moths showing conspicuous individual variation. Mr. Field entered a number of small groups of lepidoptera arranged to show the phenomena of individual variation, sexual dimorphism, etc. Mr. J. H. Rogers, Jr., had a fine exhibit which included a number of abnormal specimens of lepidoptera. Messrs. W. R. and J. D. Pearmain showed a large number of specimens in tablets. Mr. Newcomb's contribution included a series of very unusual Basilarchias, a series of *Oeneis katahdin* with specimens of *semidea* and *jutta* for comparison, and some interesting aberrant forms of different species. Mr. A. P. Hall showed some of his beautiful photographic prints of bleached wings.

Altogether the affair was a great success, though it is unfortunate that there should be such an overwhelming preponderance of lepidoptera in the exhibits. It is hoped that the present year may be marked by a larger and better exhibiton, which shall fairly represent the activity of New England entomologists.

CAMBRIDGE ENTOMOLOGICAL CLUB.

LIST OF MEMBERS, CORRECTED TO FEBRUARY 15, 1905.

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Trelease, Prof. Wm.	Shaw Bot. Gardens, St. Louis, Mo.
Weed, Prof. Clarence M.	State Normal School, Lowell, Mass.
Weeks, A. G., Jr.	8 Congress St., Boston.
Woodworth, C. W.	2043 Lincoln St., Berkeley, Cal.

* Life member.

ALPHEUS SPRING PACKARD

PSYCHE

THE ENTOMOLOGICAL WORK OF DR. A. S. PACKARD.

BY JOHN B. SMITH. SC. D.

Very few persons realize the extent or appreciate the character and value of the entomological work done by Dr. A. S. Packard. Not the systematist purely, for he will find much of the work superseded, not accepted, or so generally accepted that the original author is no longer recognized; not the entomotomist purely, for he will recognize only the specific result obtained and not the bearing of that result which Dr. Packard had usually in mind in his anatomical investigations; and surely not the modern economic entomologist, for he has now advanced far beyond any point ever reached by our author.

It is only within the past year or two, when it became necessary for me to study rather closely an almost complete series of his writings, that I began to appreciate the volume and general high standard of Dr. Packard's works. They illustrate a marvelous comprehension of the subject as a whole, a grasp of detail in many groups that is astonishing, and a knowledge of the literature that is surprising when its scattered condition and the variety of languages in which it appeared, is considered.

Dr. Packard was both an investigator and a teacher: as a teacher in the class room or in the laboratory I know nothing of him; as a teacher through books he has taught more students than any other American Entomologist. He was not a writer of numerous short papers, of hasty criticisms or of single descriptions; and yet his publications were many, some of them brief and many critical; but all had a purpose—the conveyance of knowledge or the correction of error—the correction always made without reflecting upon the honesty or capacity of him who made it necessary. Not that Dr. Packard made no errors himself: no one was more ready than he to recognize his liability in that direction, and he was not ashamed to admit it. Not infrequently he changed his conclusions, and when we compare the first edition of the Guide, with the "Text Book," the full extent of the revision of such conclusions becomes apparent.

As a systematist Dr. Packard was interested primarily in the general arrangement of the Class, and he was among the first if not the first American that accepted the necessity of breaking up some of the Linnaean orders and proposed a system of his own as a substitute. Some of his suggestions met with approval, others did not; but in all instances there was at least a plausible case and some actual characters to maintain it. The discussion was always informing, if not always convincing.

In almost every order Dr. Packard did some systematic work or discussed some point in classification: in the Lepidoptera he produced the only comprehensive illustrated revision of any family of considerable extent that has yet appeared in the United States. The Monograph of the Geometridae is as complete as it was possible to make it at the time. Material was secured from all available sources, all the literature was collated and each species was as completely made known as the conditions permitted. But it was not only a species mill: the structure of the insects was elucidated, their relationships were discussed and numerous figures illustrate the discussion. As a piece of systematic work the monograph has its faults; we see them now because of added knowledge and material:—the classification has been largely superseded; but that is the fate of all classifications: there were errors of synonymy of association and of many other divers characters; they have been corrected and the work still stands, useful as ever as a record of facts and as an illustration of the stage of knowledge at the time it was written.

Dr. Packard studied the philosophy of individual insect development from the very beginning as a necessary preliminary to the discussion of the development of the class; hence we find that he was as much at home in ontogeny as in phylogeny, and nowhere is that better illustrated than in the Text Book of Entomology, published by the MacMillan Company in 1898. There is scarcely a topic in that Book to which there is not some original contribution or some reference which indicates that there was actual knowledge and not mere quotation. And this brings up again the wide familiarity with the literature on insect structures and development; most of it printed in foreign countries or Journals, and such of it as is American, scattered in Proceedings, Transactions and Journals of the most diverse kinds. In bringing together and systematizing this mass of material Dr. Packard has rendered a service to Entomological Science which Entomologists have hardly, as yet appreciated. Some of his conclusions are disputed and may be erroneous; but the facts are given and if the expressed convictions are formed on insufficient evidence, time will enable us to make the corrections.

In the line of economic work Dr. Packard was for a time associated with Drs. C. V. Riley and Cyrus Thomas on the Entomological Commission. He contributed to nearly all the reports; but less to the strictly economic subject than to a discussion of principles and to some work on structural characters which may or may not have been entirely pertinent. Yet his connection with the economic side of the study extends back to 1871, the date of his first report on the injurious and beneficial insects of Massachusetts; and even before that he had written on the subject.

The most important contribution in this branch is the Volume on Forest Insects, published as one of the Reports of the Entomological Commission. This exhibits very strongly the painstaking method of gathering all recorded facts and of securing information from all possible sources. As a record of what is known or has been written concerning insects feeding on forest trees in the United States it is a most useful work. The weak point is the absence of a general scheme of remedial measures or forest management which may be applied with necessary modifications in special instances, to lessen or prevent injury.

Dr. Packard, while not without considerable experience in field work, was not a good field collector and observer of habits, and certainly not a good museum preparator. He was essentially a student of specimens, living and dead and of the phenomena exhibited by them.

I will make no attempt to give even a partial list of his more important works: it will suffice to say that the student who is entirely familiar with what Dr. Packard has written is, by virtue of that knowledge alone, a good entomologist.

PROFESSOR PACKARD'S "LAMARCK, HIS LIFE AND WORK."

BY ROBERT T. JACKSON.

The late Professor Packard laid naturalists under deep obligations by his full and painstaking Life of Lamarck, the only adequate account of the great French naturalist. Professor Packard gives all that he could gather by careful search in regard to his family and early life, his struggles with poverty, his activities in numerous lines of scientific work, and a careful consideration of what he accomplished in these several lines. The relations of Lamarck to his contemporaries in his work and thought is forcibly brought out and numerous extracts from Lamarck's writings show what his views were on physical and biological problems, especially evolution. The book is full of evidences of a loving care and reverence for the great master and effort to do full credit to him for his advanced views and what he accomplished.

In respect for Professor Packard's memory it is of interest to record here some of the leading features he brought out in his life of Lamarck, which from the human and scientific aspects should be of exceptional interest to all biologists.

The Life of Lamarck is the old old story of a man of genius who lived far in advance of his age, and died comparatively unappreciated and neglected. The factors of evolution as stated by Lamarck, it is now claimed by many really comprise the primary or foundation principles, or initiative causes, of the origin of life-forms.

Lamarck was born 1 August 1744, and died in Paris 28 December 1829, at the age of eighty-five years. The youngest of eleven children, throughout his life he struggled with poverty and during the last of his life for some ten years was partially, then wholly blind, although married four times he died a widower. A devoted daughter soothed his last years and acting as amanuensis gave to the world some of his important publications.

As a youth Lamarck entered the army which, owing to an injury, he early abandoned. Music, medicine and science drew his attention and he worked in a bank. When twenty-five years of age he devoted himself to botany and science thereafter claimed his entire life. For about twenty-five years he pursued botany and in 1778 published the *Flore Francaise*, a three volume work, he also published other botanical works and was connected with the Jardin des Plantes as Keeper of the herbarium.

In 1793 Lamarck, then in his fiftieth year, assumed the duties of his professorship of the zoölogy of invertebrate animals, and with the vigor of an intellectual giant took up new labors in an untrodden field both in pure science and philosophic thought. Already extensive collections had accumulated at the Paris museum and to Lamarck fell the task of arranging and classifying them as well as teaching. The result of his studies in this line was his great work in seven volumes known under the title *Animaux sans Vertèbres*, the first volume appearing in 1801, and the last, or seventh, in 1822.

Besides botany and zoölogy Lamarck studied and published on the sciences of meteorology, physics, chemistry, geology and palæontology. When a medical student in Paris he studied the clouds from his attic window and (as Professor Ward informs me) published the first classification of clouds. He was the first one to foretell the probabilities of the weather, thus anticipating by half a century the modern idea of making the science of meteorology of practical use to mankind. From 1799 to 1810 he regularly published an annual meteorological report containing the statement of probabilities acquired by a long series of observations.

In palæontology he did pioneer work, he combats the view that fossils are extinct species and that the earth has passed through a general catastrophe, but urges that species have changed as a result of time, and that fossil forms are the ancestors of animals now living. In the first published expression of his views on palæontology in 1801 we find the following truths enumerated on which the science is based: (1) The great length of geological time: (2) The continuous existence of animal life all through the different geological periods without sudden extinctions and as sudden recreations of new assemblages: (3) The physical environment remaining practically the same throughout in general, but with (4) continual, gradual but not catastrophic changes in the relative distribution of land and sea and other modifications in the physical geography, changes which (5) caused corresponding changes in the habitat and (6) consequently in the habits of the living beings; so that there has been all through geological history a slow modification of life-forms. Professor Packard therefore enters the claim that Lamark was one of the chief founders of palæontology and the first French author of a detailed palæontological work. It must be admitted that the statement generally made that Cuvier was the founder of this science must be modified though he may be regarded as the chief founder of vertebrate as Lamarck was of invertebrate palæontology.

Lamarck was a uniformitarian in his views of geology and biology in contradistinction to Cuvier who was a catastrophist. Lamarck contended that species were descended from others, Cuvier that they were permanent.

Lamarck was the master mind of the period of systematic zoology. His tabular view of the classes of the animal kingdom was to his mind a genealogical tree. His idea of the animal kingdom anticipated and was akin to that of our day. He may be said to have had a wonderfully good eye for genera. He founded the classes of Crustacea, Arachnida, Radiata (echinoderms as separate from polyps), placed the sponges (as did Cuvier) with the polyps and separated the ascidians from the mollusks.

Lamarck long believed that species were constant in nature. Evidence goes to show that he changed his views at or soon after 1793, when he entered on his zoölogical work. His first published statements on evolution were in 1801 in the preface of his *Système des Animaux sans Vertèbres*, he being then about fifty-seven years of age. He there maintains that Nature began with the most simply organized "then with the aid of much time and of favorable circumstances she formed all the others." Again "I could prove that it is not the form either of the body or of its parts which gives rise to habits, to the mode of life of animals, but, on the contrary, it is the habits, the mode of life, and all the influential circumstances which have, with time, made up the form of the body and of the parts of the animals. With the new forms new faculties have been acquired, and gradually nature has reached the state in which we actually see her."

One who has read the writings of the great naturalist, who may well be regarded as the founder of evolution, will readily realize that Lamark's mind was essentially philosophic, comprehensive and synthetic. He looked upon every problem in a large way.

"In Lamarck, at the opening of the past century, we behold the spectacle of a man devoting over fifty years of his life to scientific research in biology, and insisting on the doctrine of spontaneous generation; of the immense length of geological time, so opposed to the views held by the Church; the evolution of plants and animals from a single germ, and even the origin of man from the apes, yet as earnestly claiming that nature has its Author who in the beginning established the order of things, giving the initial impulse to the laws of the universe."

In the last chapter of his book Professor Packard deals with the revival of Lamarckian views in the school of Neolamarckians, dating from about 1866 and especially active in this country. Prominent in this school were Herbert Spencer, Hyatt, Cope and Packard. Hyatt and Packard, students of Agassiz's, and life long friends, both of distinctly philosophical minds did much by their researches to further the adoption of Lamarckian views with which they were in warm sympathy.

NOTE.—Mrs. Packard has a number of reprints of Dr. Packard's recent paper on "The Origin of the Markings of Organisms, etc.," (see Index to Periodical Literature) for the distribution of which he left no mailing list. Those who desire copies of the paper are invited to notify her, at 275 Angell St., Providence, R. I.

THE NOMADINE AND EPEOLINE BEES OF SOUTHERN MAINE.

BY J. H. LOVELL AND T. D. A. COCKERELL.

In southern Maine (Waldoboro, Lincoln County) the Nomadine and Epeoline bees are represented by only two genera *Nomada* and *Triepeolus*. The species are few and individual specimens are taken at rare intervals. The species of *Nomada* begin flying as early as April 24th, visiting the aments of *Salix discolor*, which with the exception of the Mayflower is the first nectariferous plant blooming in this locality; and continue on the wing as late as July 30th, when they have been taken on the infloresence of *Aralia hispida.* All of the specimens of *Triepeolus* have been collected in August on the flowers of the *Compositae.*

Nomada.

The species of *Nomada* run into local races and species in different parts of the country, and the Maine species possess certain peculiarities of their own. Two are distinct enough to be treated as new species, though it is not impossible that the discovery of intermediates in localities still unexplored for bees may eventually cause them to be reduced to subspecific rank. Two others, here called varieties, may prove more separable than is here supposed, when larger series have been obtained.

Nomada (*Gnathias*) *bella* Cr.

1863 *Nomada bella* Cr. ♀ ♂ Proc. Ent. Soc. Phil. 2: 287,

1863 *Nomada maculata* Cr. ♀ ♂, Proc. Ent. Soc. Phila. 2:303 (in part).

1902 *Nomada bella* Rob. ♀ ♂, Ent. News, 13: 80, no. 3.

1903 *Nomada bella* Ckll. ♀ ♂, Proc. Ac. Nat. Sci. p. 601.

Variety a of *N. maculata* ♀ was based on five specimens from Maine, Conn., Penn., and Delaware. The local specimens correspond in every particular to the description except that the spots on the fifth segment are obsolete as well as those on the fourth. The characters of the males are also similar to those given by Cresson. Length 10 to 11 mm.; mandibles bidentate; the largest species in this locality. Taken from April 24th to July 11th. Early in the season they are visitors to the willows *Salix discolor* and *S. Bebbiana.* Male and female specimens of *N. bella* from Elkhart, Indiana, are the same as the local species except that the cream-colored spots on the apical segments are usually well developed.

Nomada (*Gnathias*) *cuniata* Rob. var. e.

1903 *Gnathias cuneatus* Rob. ♀ ♂, Can. Ent. 35: 175, no. 6.

♀. — Length 8mm.; mandibles bidentate; resembles *N. bella* but is smaller, with thorax trilineate. Head and thorax red, not coarsely punctured; white pubescence on cheeks and pleura long; a black dot on each side of clypeus, the area about the insertion of antennæ and ocelli black, a red spot on supraclypeus; occiput black; antennae ferruginous, fourth joint longer than third. Mesothorax trilineate, the middle band broad; scutellum and post-scutellum red, sutures black; pleura black above with a red spot, red below; metathorax with broad black bands at the sides and in the center; tegulae and tubercles ferruginous. Legs red; upper third of anterior and middle femora black beneath; posterior femora blackened behind. Wings dusky, apical margin darker; palelunule distinct; basal nervure basad transverse medial nervure more than the length of the latter; third transverse cubital nervure strongly angulated in the middle. Abdomen red, broad, strongly convex; black area on basal segment lobed in the center; a pair of small cream colored spots on the sides of second segment; apical segments without markings.

Waldoboro, Maine, May 18.

Nomada (Xanthidium) subrutila n. sp.

♂.— Basal nervure meeting transverse medial; flagellum obscurely denticulate, lively ferruginous beneath; supraclypeal mark well developed, surrounded by black; orbits yellow except at summit behind; third antennal joint on the short side much shorter than fourth; scutellum black with two small yellow spots; metathorax entirely black; tegulae light yellow, with a hyaline center and margin; band on first abdominal segment broadly interrupted, the posterior part of the interval reddish; bands on second and third segments not at all interrupted; anterior and middle tibiae yellow, with a black or dark brown mark behind. Other characters as in *N. luteola* and *N. luteoloides*; size that of a rather small *luteola*.

One male taken on *Viola rotundifolia* May 4th. The species recognized in this group are very closely allied, but the present one seems as distinct as any.

Nomada Cressonii Rob.

1863 *Nomada maculata* Cr. ♀, var. b, Proc. Ent. Soc. Phil. 2:304.

1893 *Nomada Cressonii* Rob. ♀ ♂ Trans. Am. Ent. Soc. 20:275.

This species has been taken on *Viburnum Alnifolium* and *Cornus Canadensis* from May 19th to July 11th.

Nomada florilega n. sp.

♀.—Length about 8 mm.; black and red, rather robust. Face, cheeks and pleura clothed with white pubescence, sides of metathorax fringed with long white hair. Mandibles except apices which are darkened, labrum, clypeus, usually a narrow line along the orbits, and vertex red; face, region of ocelli, cheeks and occiput black; flagellum ferruginous in front, blackened behind, third joint shorter than fourth. Tegulae and tubercles ferruginous; mesothorax dark red tinged with black, with a rather broad median longitudinal line; sutures black; metathorax entirely black, pleura black above with a middle red spot, red below. Legs red, coxae largely black; upper half of anterior and middle femora black beneath; posterior femora blackened behind except at extreme apex; first and second joints of hind tarsi blackened without. Wings dusky, strongly darkened on apical margins; stigma ferruginous, outer half darker than the inner; basal nervure basad transverse medial; second submarginal cell about one half as wide on the radius as on the cubitus; second and third transverse cubital nervures strongly curved; lunule rather prominent. Abdomen oval or oblong oval, convex; basal half of first segment black, posterior margin of black area cordate; a pair of small cream-colored spots on the sides of segment two; on segment three two minute dots; apical segments without ornaments.

Taken on *Aralia hispida* and *Spiraea salicifolia* during the latter half of July. Nearest *N. sayi*, but larger and darker, the metathorax being entirely black, and the red of the coarsely sculptured mesothorax very dark.

Nomada nigrocincta Smith, var. d.

1879 *Nomada nigrocincta* Sm. ♀ Des. New Sp. Hym. p.99.

♀.—Length 8mm.; ferruginous and black. Head and thorax rather finely punctured; pubescence on cheeks, pleura and sides of metathorax white, on face and disc of mesothorax fuscous. Mandibles except tips, labrum, clypeus, spot on supra-clypeus, a narrow stripe around the eye, and antennæ ferruginous; area about insertion of antennæ, about ocelli and occiput black. Prothorax black; mesothorax trilineate, the middle band rather broad; scutellum largely red, postscutellum black; metathorax entirely black; pleura black, red spot beneath the wings, another anteriorly on each side of the forelegs; tegulae and tubercles ferruginous. Legs ferruginous, marked with black much as in the preceding species, Wings nearly hyaline, slightly dusky at apex; basal nervure very little basad of transverse medial, much less than in the preceding species; second submarginal cell along the radius nearly as long as second transverse cubital nervure; third submarginal along the radius fully one half as long as second submarginal

Abdomen oblong-ovate, ferruginous, without maculae, the apical margins fuscous or blackened; posterior margin of black area on basal half of first segment straight; pygidial plate broad and rounded.

Collected May 18th. Distinguished by its color from any other of the local species. This may represent a distinct race, but the single specimen obtained has the essential characters of Smith's species, and is really more typical of it than the insect from Corvallis, Oregon, which has been referred here.

Triepolus.

Triepolus donatus Smith.

1854 ***Epeolus donatus*** Sm. ♀ ♂, Cat. Hym. Brit. Mus. 2:256.
1864 ***Epeolus donatus*** Cr. ♀ ♂, Proc. Ent. Soc. Phil. 2:396.
1882 ***Epeolus donatus*** Prov. ♀, Nat. Can. 13:236.
1883 ***Epeolus donatus*** Prov. ♀, Faun. ent. Can. Hym. p. 719.

Though rather rare this species is more common in this locality than any other of this genus or of *Nomada*. Both sexes have been taken from August 11th to August 24th on the goldenrods, thistles, *Inula Helenium* and *Eupatorium perfoleatum*.

Triepeolus scutellaris Say.

1824 ***Epeolus scutellaris*** Say, ♀, Long's 2nd Exp. 2:355.
1859 ***Epeolus scutellaris*** Say, ♀, Lec. ed, Say's Writ. 2:240.
1864 ***Epeolus scutellaris*** Cr. ♀, Proc. Ent. Soc. Phil. 2:397.
1888 ***Epeolus scutellaris*** Prov. ♀, Add. faun. Can. Hym. p. 332.
1897 ***Epeolus scutellaris*** Rob. ♀ ♂, Trans. Ac. Sci. St. Louis, 7:343.

Two males taken on *Solidago* in August are referred to this species, which has been reported from Florida to Canada. They agree with the description in size and in the form of the dilated thoracic teeth, but not entirely in color. The mandibles, tubercles, tegulae, lateral teeth, scutellum in one specimen, and legs are ferruginous; but tbe antennae and basal segments of the abdomen are black.

Triepeolus pectoralis Rob.

1897 ***Epeolus pectoralis*** Rob. ♀ Trans. Ac. Sci. St. Louis, 7:345.

Both sexes taken on the flowers of *Solidago* August 17th. The female has the mesothorax closely and finely punctured, and the pleura below coarsely and sparsely punctured. The male is undescribed.

♂. — Length about 8mm., closely resembles the female. The face clothed with silvery white, the pleura and pectus with cinereous pubescence. Ornaments of thorax and abdomen buff-colored, fascia of sixth segment white.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE—LIX.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Euchlaena astylusaria Walker.

Egg. Elliptical, well flattened, one end depressed, truncation rounded, not very obvious. Surface dimly hexagonally reticulate, the cell areas rather deep and pronounced but not sharp and all overlaid and obscured by fine granules of shagreen. Towards the large end the pores at the angles of the reticulations are marked by large, distinct, rounded white elevations, but these become small towards the center of the egg and are lacking on the small end and the flat sides. Truncation reticular without white elevations. Bluish green, frosted by the white dots, turning bright red. Size 1 x .6 x .5 mm.

Stage I. Head brownish luteous, the sutures dark. Body moderate, subdorsal and ventral broad red brown stripes, the subdorsal pair fused on joints 10-13 and marked in pale on the cervical shield. Sides white; abdominal feet stained with red, thoracic ones luteous.

Stage II. Head rounded bilobed, whitish, clypeus and epistoma white, all the sutures dark brown; two parallel rows of gray dottings over the lobes; width .55 mm. Body slender, greenish white; broad subdorsal bands joining posteriorly, dotted on joint 2, and broad ventral band purple brown. Thoracic feet brownish black, the abdominal ones reddish. Tubercules pale, setae black, both minute.

Stage III. Head oblique, flat before, lobes full; whitish with vertical rows of brown dots; and band across the bases of the antennæ; width 1 mm. Body moderate, slightly flattened, tubercles raised; dorsum brown, darker posteriorly on the segments, a geminate dotted dorsal line pale filled; sub-ventral fold white, subventer brown, venter dark purplish brown with fine geminate medioventral pale line. Small segmentary black subventral spots under the white fold. Feet pale; tubercles small, black; setae minute.

Stage IV. Head widest below, slightly bilobed, clypeus depressed; gray, spotted with black heaviest on the lower angles of the lobes and across above the mouth; a pale streak on the side, width 1.5 mm. Body moderate, slaty gray, slightly streaked. Tubercles ii of joints 5, 8, 9 and 12 elevated, papillose, black, with black subdorsal blotches beside them, present but less distinct on the other segments. A broken, diffuse white band along the sub-ventral fold. Abdominal feet whitish outwardly, lined with black in front. Subdorsal, lateral and suprastigmatal pale lines indicated.

Stage V. Head round, somewhat quadrately bilobed; whitish gray mottled with darker, a black patch each side of the clypeus below and across above the mouth and on bases of antennæ, width 2.3 mm. Body moderate, tubercle ii raised and marked in black, especially on joints 5 and 11. Ashen gray with traces of waved white lines; dorsum of joints 5, 6, 7 and 8 washed in whitish, sides with irregular black marks, whitish intersegmental washings on the subventral fold; foot of joint 10 whitish, the others gray. Feet of joint 4 erected, the others appressed. The resemblance is to bark, all the markings being illy defined.

Eggs June 14, mature larva August 6, single brooded with hibernation in the pupa. Larvæ from Kaslo, British Columbia.

NOTES ON SHORT EXPERIMENTS BEARING ON THE RELATION OF LARVAL TO ADULT LEGS.

BY ALEC. ARSENE GIRAULT, WASHINGTON, D.C.

"The real relations of the adult legs to the larval legs are thus shown by Gonin.

'If we carefully strip off the skin of a caterpillar near the time of pupation (Fig. 608), we see that the extremity only of the legs of the imago is drawn out of the larval legs; the other parts are pressed against each side of the thorax: near the ventral line a small pad represents the coxa and the trochanter; the femur and the tibia are distinctly recognizable, but soldered to each other and only separated by a slight furrow; they form by their union a very acute knee or bend. The femur is movable on the pad-like coxa, the tibia continues without precise limits with the extremity concealed in the larval legs. The three divisions of the latter do not appear to have any relation to the five joints of the perfect state. Under the microscope the rudiment appears very strongly plaited at the level of the tarsus, much less so in the other regions. A large trachea penetrates into the femur with some capillaries; reaching the knee it bends into the tibia at a sharp curve, but does not become truly sinuous in approaching the extremity. It is then the tarsus especially which is susceptible of elongation; it may, on being withdrawn, give rise to the illusion that the whole organ is disengaged from the larval leg.

Even when we cut off the limb of the caterpillar at its base, we only remove the tarsus of the imago; the femur and the tibia remain intact. From an evident homology Réaumur has erroneously concluded that there is an identity. His opinion, classical up to this day, that the limb of the butterfly is entirely contained in the leg of the caterpillar, has been found to be inexact and should be abandoned.' "[a]

From the foregoing quotation, the following short experiments performed on the larvæ of *Heliothis obsoleta* Fabricius,[b] are easily understood.

On the 20th of June at Paris, Texas, ten (10) full-grown larvæ of this insect were taken from ears of corn and placed on fresh soil in the laboratory. They were ready to enter the soil. The anterior legs of each were immediately cut off with sharp scissors, taking care, during the operation, to remove the articulated joints only. The larvæ were then allowed to enter the earth, which six of them successfully accomplished during the following night. The remaining four were found dead and were removed.

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[a] Packard. A Text-book of Entomology 1898 pp 654–655.

[b] Formerly *Heliothis armiger* Hübner.

From these six larvæ, three moths appeared on July 7th, following. Of the three, two had perfect legs. But the other had *two of the apical joints of its dextral foreleg missing, the third and last joint bearing the usual tarsal claws.* The conclusion to be drawn is obviously indicated by reference to the lines quoted.

Other experiments performed were failures because of the corresponding moths not issuing. The pupa of a larva whose legs had been amputated at the origin of the articulated joints, was dissected when some days old, and the half-formed moth found with perfectly formed limbs.

Two full-grown larvæ were transferred to soil in a large glass jar and treated as formerly, but in addition to the articulated joints, a portion of the large lobe of the body to which the legs are appended was also removed, doubtless injuring the so called histoblast. When cut, both of them jumped violently and a stream of dark liquid was ejected from the mouth. They immediately crawled off, however, when liberated seemingly not missing the pair of legs. The wounds bled for a short while, but healed the next day, then showing as large blackened scars. Although feeding voraciously, and apparently ready to pupate, both suddenly declined and died, and for lack of time the experiment was not repeated.

The percentage of moths successfully emerging from larvæ thus mutilated is very small, and it is very necessary to use larger lots in experiments such as these.

RECENT ENTOMOLOGICAL LITERATURE.

EARLY STAGES OF CARABIDAE.

Among the recent publications on Entomology is one which is of especial interest to Coleopterists, by Dr. George Dimmock and Mr. Frederick Knab, entitled: "Early Stages of Carabidae," (Springfield Museum of Natural History, Bulletin No. 1, 1904, pp. 1–55, pls. 1–4). It is certainly a valuable contribution to our knowledge of the larvæ and metamorphoses of the family of which it treats, and is of interest to systematists as well as to students of life history, for, as is every day becoming more apparent, when our knowledge of the early stages of Coleoptera is sufficiently developed, we shall doubtless find that the larval characters will be of much service in determining the correct position of many groups the relationship of which is now more or less obscure.

The article is written by Dr. Dimmock from notes taken by both authors. Plates 1–3 are drawn by Mr. Knab, the fourth plate by Dr. Dimmock.

After a few prefatory remarks, the reader is informed of the method employed by the authors in rearing larvæ, and directions are given for so doing, as well as for the proper study of them. Great stress is laid upon the importance of the study of larval exuviæ, which often "reveal many structures not visible on the larva itself," and instructions are given for mounting on microscope slides in order to preserve them for examination. This is followed by a thorough resumé of our present knowledge of the characters of Carabid larvæ, evidently the result of long and careful reading and study. Each character is fully discussed, examples are cited, and references given to an ample bibliography, which closes the paper.

A large part of the paper is devoted to descriptions of the metamorphoses of *Dicaelus purpuratus*, *Brachynus janthinipennis*, *Pterostichus stygicus and P. adoxus*, those of the last two species having not been described heretofore. Very full and detailed descriptions are given of the larvæ, larval habits, pupa, emergence and changes in color, both before and after emergence. In the descriptions of the larvæ, a system of formulæ is employed, which seems to be a very useful method for the comparison of the jointed appendages of different species, as well as of the proportionate length of the joints themselves. This is best explained in Dr. Dimmock's own language. With regard to the antennæ, he says: "The proportionate length of the joints of the antennæ differs according to genera and species. It is conveniently shown in descriptions by means of antennal formulae. They are made up of the successive lengths (relative or absolute) of the joints,—the proximal first, the distal last—with the length of the appendix enclosed in parentheses." The following will serve as an example, the length being given in millimeters:

"Antennal formula in larval exuviae at pupation:

0.38 1.62 1.85 (0.03) 2.15"

The resumé of characters above referred to is so thorough and of such general interest we give it in full, only regretting that lack of space prevents us from adding the copious notes and references which follow the description of each member. Carabid larvæ are thus defined:

"Hexapod larvae with the ventral side of the body straight, i. e., fitted for locomotion on horizontal surfaces; and with nine abdominal segments, the last exserted and bearing an anal tube and almost always a pair of cerci.

"Stigmata rounded, open; one thoracic and eight abdominal pairs; those of the thorax large, at each side of the mesothorax, beneath the anterior angle of the dorsal scute; those of the abdomen smaller, lateral, on each of the first eight abdominal segments. Gills never present.

"Head corneous, porrect, with the very small suctorial mouth usually directed anteriorly and the cervical foramen posteriorly.

"Frontal angles more or less ascending in an oblique direction above the mandibles; in most cases defined by a deep furrow; acute, obtuse or rounded at their apex.

"Epistoma usually included in the vertex.

"Clypeus concrete with the epistoma; labrum wanting.

"Hypostoma usually short and included in the occiput.

"Ocelli usually six on each side, generally on a defined ocellar area, which is often protuberant.

"Antennae filiform (exceptionally conical), four-jointed, the slender apical joint tipped with sensory setae. The distal end of the third joint bears an appendicular joint, or appendix, which is sometimes very minute.

"Mouth-parts exserted, free.

"Mandibles falciform, acute, directed forward and somewhat upward, not suctorial, and with a tooth, or retinaculum, on their inner side, at or posterior to their middle.

"Maxillae inserted between the mandibles, near the labium; cardo extremely short, fixed; stipes flattened cylindrical, directed anteriorly. The slender two-jointed exterior lobe (galea) of the maxillae is inserted on the maxillary stipes, and is motile. Interior lobe (lacinia) rudimentary or wanting. Genae without maxillary scrobes. Maxillary palpi filiform, three-jointed, sparsely furnished with setae, and borne on a short conical palpigerous stipes (squama).

"The mentum is small, usually transverse, trapezoidal. The stipites of the labial palpi are concrete; taken unitedly, quadrate-clavate. Labial palpi two jointed, often sparsely setose. The ligula generally bears two setae.

"Thorax of three segments, of which the prothorax is longest; each segment, except in rare cases, provided with dorsal scutes.

"Dorsal scutes of thorax concrete at median line, those of the prothorax entire and concealing the sides.

"Praeterga of thorax usually evident, often strigose; praetergum of prothorax the longest.

"Postterga of thorax usually evident, often strigose.

"Sternal scutes of prothorax evident, usually concrete at median line; those of the mesothorax and metathorax minute or wanting.

"Legs six-jointed; consisting of coxa, trochanter, femur, tibia, tarsus, claw (usually double); of moderate length, showing in dorsal view of the larva, when they are extended, at least part of the tibiae and the tarsi and claws.

"Coxae conical, exserted, in length less than four times the thickness of their base; with a (sometimes short inconspicuous) femoral scrobe; increasing in length from fore to hind pair.

"Trochanters clavate, usually shorter than the coxae, and bearing ambulatorial setae.

"Femora clavate, setose, and usually shorter than the coxae.

"Tibiae more or less clavate, more than one-third as long as the femora.

"Tarsi exserted, movable, usually conical-cylindrical; equaling the coxae in length, or shorter; usually longer than the tibiae.

"Claws usually two on each foot. Empodia generally of two very short setae.

"Abdomen straight, more or less depressed, cursorial or ambulatorial, longer than the thorax, and with the dorsum unarmed. Ninth abdominal segment exserted.

"Dorsal scutes, when present, on the abdomen, concrete at median line, and with praeterga and postterga.

"Dorsal scute of the ninth abdominal segment usually present.

"Lateral scutes of the abdomen often defective; when present, exserted, oblong, convex.

"Ventral scutes of the abdomen often defective. When developed, seven on each segment. viz: a large transverse median scute anteriorly; behind this a transverse row of four small scutes, of which the median pair may be concrete; at each side of these five scutes an elongate longitudinal scute. On the eighth and ninth abdominal segments the five median scutes are more or less concrete.

"Anal tube exserted; conical, conical-cylindrical or cylindrical; usually somewhat longer than the ninth abdominal segment, and generally used in locomotion. Anus terminal.

"Cerci, with rarest exceptions, present, and attached to the dorsum of the ninth abdominal segment.

"Habits active, commonly predaceous; usually subterranean, or living under stones or pieces or wood, or beneath loose bark on decaying trees; usually nocturnal, or shunning light.

"Larval stages number three (or four)." R. H.

REPORT OF THE NEW JERSEY STATE AGRICULTURAL EXPERIMENT STATION UPON THE MOSQUITOS OCCURING WITHIN THE STATE, THEIR HABITS, LIFE HISTORY, ETC.—BY JOHN B. SMITH.

It is not often that two so large and excellent works on the same subject appear almost simultaneously as those of Doctors John B. Smith and E. P. Felt on the mosquitos of their respective states. Dr. Smith's report is of 482 pages, illustrated by 133 figures (mostly full page plates) with maps of various sections. It is divided into four parts: I. "Mosquito Characteristics and Habits"—in which the larval, pupal and adult structure are shown by large figures with all the parts clearly defined, also the mouth parts and biting habits are fully described; a chapter on how mosquitos develop is followed by accounts of their hibernation, their relation to disease, and how to study, collect, and preserve them. Part II is devoted to their natural enemies, remedial measures and destructive methods. Part III, on classification, occupies pages 149 to 364; tables for determining the adults and larvæ are followed by full descriptions of the species, their life habits, distribution, etc., and exceedingly beautiful drawings of both the imago and larva, supplemented by enlarged figures of parts essential in classification. Thirty-seven species are described, and many of the species figured for the first time.

The author is to be congratulated on making a work thoroughly scientific, yet popular in the way it is presented. Generic frills are avoided, and a series of common names adopted, which will undoubtedly appeal more to the public and create a general interest not otherwise attained; thus with the co-operation of all enterprising citizens the mosquito nuisance can to a great extent be mitigated. The closing part treats of "local problems and surveys." The principal breeding places throughout the state are designated, and what has already been done and what should be done is clearly pointed out.

C. W. J.

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Aurivillius, C. Cerambyciden aus Bolivien und Argentina, gesammelt von Freiherrn Eland Nordenskiold*, 67 p. 205, 1904. [New genus *Erlandia*]. **Barber, H. S.** Note on *Thaumatoglossa* (*axinocerus*) *americana* Jayne, 102 vii, 10. **Blackburn, Rev. T.** Further notes on Australian Coleoptera, with descriptions of new genera and species*, 170 xxviii, 281. **Chagnon, G.** Canadian *Cerambycidae*, 5 Feb. **Chittenden, F. H.** On the species of *Sphenophorus* related to *percinax* 01., with descriptions of other forms*, 102 vii, 50. [12 new species and varieties.] **Gebien, H.** Verzeichnis der von Prof. Dr. Yngve Sjöstedt in Kamerun gesammelten Tenebrioniden, 159 ii, no. 5. **Heller, Dr. K. M.** Rüsselkäfer aus Kamerun gesammelt von Prof. Dr. Yngve Sjöstedt*, 76 p. 161, 1904, [New genera *Pseudostroborhinus Dichelotrox, Aphanomastrix*]. **Houghton, C. O.** A list of Coleoptera taken on the summit of Mt. Seward, N. Y. 5 Feb. **Knab, F.** The spreading ot *Sphaeridium scarabaeoides* L., 5 Feb. **Lea, A. M.** Descriptions of Australian *Curculionidae*, with notes on previously described species*, 170 xxviii, 77. [New genus *Matesia*]. **Wickham, H. F.** North American species of *Cotalpa**, 6 xiii, 1.

HYMENOPTERA.

Aurivillius, C. Svensk insektfauna (Hymenoptera aculeata), 67 p. 241, 1904. **Bradley, J. C.** Corrections in *Evaniidae*, etc.*, 4 Feb. **Enderlein, Dr. G.** (a) Die Braconiden—subfamilie *Mimagathidinae**, 22 xxviii, 449. [New genus *Mimagathis*]. (b) Uber die Klassifikation der Stephaniden*, 22 xxviii 473. [New genera *Parastephanus, Diastephanus*]. **Friese, H.** (a) Die Kegelbienen Afrika's (genus *Coelioxys*), 159 ii, no. 6. (b) Die Keulhombienen Afrika's (genus *Ceratina*), 38 xxiv, 1. **Graenicher S.** On the habits of two ichneumonoid parasites of the bee *Ceratina dulpa* Say, 5 Feb. **Lovell, J. H.** Four new species of *Halictus* from Maine,* 4 Feb. [New species *hortensis, versans, oblongus, nubilus*].

PROCEEDINGS OF THE CLUB.

The Annual Meeting was held at 194 Clarendon St., on the evening of January 17, 1905. President Emerton in the Chair; 18 members present. Officers for the ensuing year were unanimously elected as nominated by the nominating Committee, the list being as follows:

President, J. H. Emerton;
Secretary, J. W. Dow;
Treasurer, Roland Hayward;

Members at large of Executive Committee, P. G. Bolster, C. W. Johnson.

Messrs. F. Goeben, Donald Munro and A. C. Burrill were unanimously elected to membership.

Mr. Emerton exhibited an enormous mat of cocoons of the bee-moth, attached to the side of a hive. This was Mr. Bowditch's contribution to the evening's program.

Mr. Morse told of his recent examination of the Orthoptera taken in the Bahamas by Dr. Allen and his associates, and exhibited specimens. He also spoke briefly of his studies of Orthoptera from the western peninsula of Michigan, obtained by an expedition under the direction of Dr. C. C. Adams, and of some other interesting forms from North Carolina.

Mr. Johnson showed a specimen of *Ulolodes quadripunctatus* taken by Mr. J. A. Cushman at Manomet, Mass. This is apparently the first New England record for this insect.

Mr. Frost showed a specimen of *Zeuzera pyrina* taken in Medford, Mass., in 1903,— the first specimen known to have been taken near Boston.

After a short recess, during which refreshments were served, Mr. A. H. Clark gave an interesting account of some of his West Indian experiences; and Mr. Hayward told of the receipt from Utah of three more asymmetrically punctured examples of *Bembidium scudderi*, like that described recently in Psyche.

The meeting was then adjourned.

At the February meeting, held February 21 at 43 Tremont St., Mr. C. V. Blackburn was unanimously elected Secretary in place of Mr. J. W. Dow, resigned; and Mr. Guy W. Lucas was unanimously elected to membership.

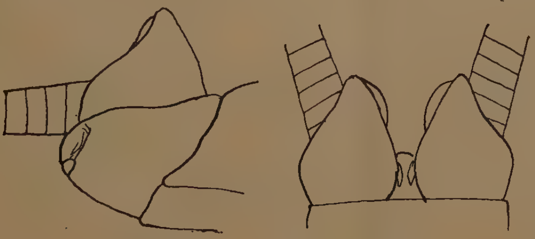
NEW GENERA AND SPECIES OF PERLIDÆ.

BY NATHAN BANKS, WASHINGTON, D. C.

In going over my collection of stone-flies preliminary to a revision of the species, I found three new generic forms; one of them has just been described by Mr. Needham as *Peltoperla*; the two others are here described, as well as a few new species.

Perla attenuata n. sp.

Pale dull yellow; antennæ dark, paler on base; pronotum rather dull brownish; apical half of the abdomen brown; setæ brown, paler toward tip; wings hyaline, veins yellowish brown. Posterior ocelli rather closer to each other than to the eyes, and fully as far from the anterior ocellus; pronotum very broad, not much narrowed behind; anterior wings rather narrow, the discal cell is very slender and attenuate at base, the radial sector not bending out when arising from the radius as in other species, but running straight out or even curving forward a a little so that the discal cell is very narrow for a considerable distance; many median and cubital cross-veins; radial sector with four branches in one specimen, three in another, beyond the cross-vein. The male genital area is concave, and between the bases of the setæ is seen a pair of small, shining hamules, or hooks, pointing forward. The ventral plate, which is rather broad, has an elevated transverse shining spot in the middle, and from each side of which a furrow extends outward and upward. Expanse 47 mm. Two specimens from Douglas Co., Kansas, June and July.



Side. Top

Perla Kansensis ♂

Perla kansensis n. sp.

Pale yellowish, ocelli on black spots, a faint dark cloud on each side of the disk of pronotum, and the tip of the abdomen is brown; wings pale yellowish hyaline, venation wholly yellowish. Head broad, ocelli forming an equilateral triangle, and the posterior ocelli as close to eyes as to each other; pronotum narrowed behind, anterior angles acute, posterior ones rounded; legs short, the tibiæ plainly broader than usual, slightly swollen in middle. Discal cell arising beyond the second cross-vein of median area; the radial sector usually twice forked beyond the cross-vein. In the male the tip of the abdomen has a large conical tubercle above base of each seta, which viewed from below and behind is seen to be bilobed at tip. Expanse (♂) 35 mm. Douglas Co., Kansas, August.

Perlinella cinctipes n. sp.

Head yellow, a broad, black intra-ocellar spot extending forward, and also laterally. Posterior ocelli as close to eyes as to each other, and fully as far from the anterior ocellus. Antennæ yellowish on basal part, beyond brown. Prothorax black, with a narrow median yellowish stripe; rest of thorax brown; legs yellowish, tarsi brown, femur I with a dorsal black streak, femora II and III with a broad black band. Abdomen brown above, pale below, but darker before the tip; setæ pale, joints tipped with brown, slender, and with a few long hairs at tip. Wings faintly brownish, venation pale, costal area yellowish, radial sector with one branch, arising farther out than in *P. placida* Hag. Length 10 mm., expanse 18 mm. Two specimens from Onaga, Kansas. Readily distinguished from *P. placida* Hag. and *P. decipiens* Walsh, by the broad black bands on femora II and III.

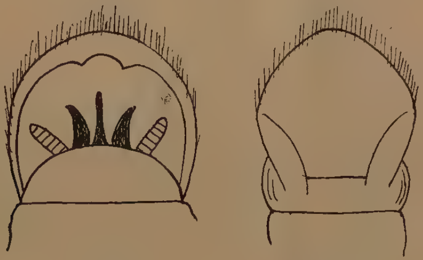
Atoperla n. gen.

Caudal setæ present, slender, with elongate joints, each tipped by a whorl of long hairs; with two ocelli, nearly as far apart as from the eyes; a folded anal space to hind wings; radial sector with but one branch beyond cross-vein, about three cross-veins beyond end of the subcosta. Type *Perla producta* Walsh. By its two ocelli it is allied to *Neoperla*, but differs from that genus by the nature of the setæ which are similar to those of *Perlinella placida* Hag., in fact I think the structure of the setæ is of more value than the number of ocelli. *Peltoperla*, the other genus with two ocelli, has very short setæ; its one species, described from New York, also occurs in West Virginia.

Tænionema n. gen.

Setæ practically absent, very short. Tarsi with three sub-equal joints, the second as long as first, and the third a little longer than others. In both pairs of wings the subcosta is connected to the costa by three or four cross-veins, and in all wings there is a strong, oblique cross-vein beyond the end of the subcosta, which with the other veins near by tends to form an X, not however as distinct as in *Nemoura;* in the fore-wings the cubitus at end of series of cross-veins curves upward toward the branch of median vein, thus forming a very large cell. Type —*T. analis*.

This genus combines the characters of *Nemoura* and *Tæniopteryx*, especially that section of *Tæniopteryx* called *Rhabdiopteryx* by Klapalek. It differs from all *Tæniopteryx* groups by the strong cross-vein beyond the subcosta, a character of *Nemoura;* from *Nemoura* it is well separated by the long second tarsal joint, and the costal cross-veins, the latter character found also in *Rhabdiopteryx*. The subgenital plate of the male is much like that of the European *Œniopteryx loewii* Alb., but still larger.



Above. Below.

TAENIONEMA ANALIS
Genitalia ♂

Tænionema analis n. sp.

Head shining blackish, with a pale spot in the middle, and another on clypeus; antennæ uniform dark brown; pronotum mostly blackish, but the sides rather broadly yellowish, not strongly rugose; rest of thorax black; a pale spot in middle of base of the mesothorax; abdomen black, subgenital plate yellowish; legs pale yellowish, tarsi darker; wings hyaline, venation dark. Length 13 mm., expense 24 mm. From Ft. Collins, Colorado, 31 March, and Las Vegas, New Mexico (Cockerell.)

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LX, LXI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

LX. *Melanolophia canadaria* Guenée. I have distinguished the Eastern and Western races of this species in an article on the fauna of the Kootenay District of British Columbia (Proc. U. S. Nat. Mus., XXVII, 910, 1904); the larvæ here described are those of the Western race.

Egg. Elliptical, flattened, depressed, truncated end rounded and only slightly flattened; reticulations fine, formed by the edges of concave pits which are irregularly hexagonal with no defined pattern except centrally, where the egg is somewhat constricted; they tend to line in longitudinal rows; they are distinctly raised, but have broad bases. Bluish green, slightly frosted, later shaded and spotted with pink at the truncated end. Size .9 x .6 x .5 mm. Most of the eggs were laid stuck under a piece of paper and they are probably laid in nature in the crevices of the bark.

Stage I. Head rounded bilobed, higher and wider than joint 2, pale testaceous, eye black, mouth brown. Body rather short, normal, actively looping. Pale green, with dorsal, subdorsal and lateral smoky olivaceous bands, stigmatal region broadly pale; a broken subventral line and ventral band of smoky. Shields concolorous, but without the lines; tubercles and setæ concolorous, obscure; setæ short, white, capitate; feet pale.

Stage II. Head rounded bilobed, luteous, eye black, mouth brown; width .6 mm. Body normal, moderate, smoky greenish, finely obscurely lined in whitish, appearing as before. The pale lines are addorsal, subdorsal, lateral and stigmatal. Cervical shield lined, anal plate with whitish edges. Tubercles pale, hair dots and setæ black, small.

Stage III. Head rounded, bilobed, clear orange yellow with faint dusky mottlings on the lobes, ocelli black; width 1.05 mm. Body moderate, not elongate, pale green, the anal end orange tinted. Stripes broad, dusky olivaceous, obscurely geminate by their edges; dorsal, subdorsal, lateral, suprastigmatal, subventral and ventral, leaving the substigmatal space obscurely whitish. Tubercles and setæ small, black.

Stage IV. Head rounded bilobed, full, yellowish green, setæ black; width 1.6 mm. Body moderate, not elongate, anal feet large, spreading. Green, the addorsal line pale, darker green filled, subdorsal pale; sides faintly darker with a pale waved lateral line close to a broad yellowish white stigmatal one; venter dark, shaded with pale subventral and broad medio-ventral bands. Feet pale; tubercles concolorous, setæ short, dark; no shields.

Stage V. Head bilobed, flattish before, oblique; light green, faintly reticulate, ocelli in part black; width 2.6 mm. Body cylindrical, moderate, smooth, light green, the color of the young needles, slightly white shaded, leaving a dorsal line of darker green edged by the white. Subdorsal and substigmatal lines white, moderate, equal; faint traces of a waved lateral line; subventral and geminate ventral line yellowish, very faint. Tubercles obsolete, setæ dark, fine; spiracles ochraceous; feet green, smoky tipped; no shields.

The larvæ, when mature, became reddish and entered the ground to pupate. Eggs June 4, mature larvæ July 9; single brooded, hibernation in the pupa. The larvæ fed on the needles of spruce, eating only the pale ones of the same year's growth, which they closely matched in color. Larvæ from Kaslo, British Columbia.

LXI. *Petrophora convallaria* Guenée. This species is not improbably the same as the European *munitata* Hübner. My specimens agree with what Guenée says of his *convallaria*, and I have no doubt that it was this form he had before him.

Egg. Rounded elliptical, no flattening, truncation and depression indicated, but rounded; smooth, shining pale yellow, reticulations barely indicated as shadowy lines, regularly reticulate; very shining; size .6 x .5 x .4 mm.

Stage I. Head cordate, pale brown, eye dark. Body slender, curled in S-shape, all dark sordid olivaceous with short capitate setæ; no shields, no marks; tubercles and feet concolorous.

Stage II. Head whitish, dotted, especially on the sides, with dark brown, eye black; width .5 mm. Body slender, elongate, translucent green from the food; broken dorsal, faint subdorsal, distinct lateral, faint suprastigmatal brown lines, the lateral line olivaceous brown. Venter finely streaked in brown; faint substigmatal, more distinct subventral and medioventral lines. Setæ very short, capitate; tubercles colorless with black hair dots. Stigmatal region and feet pale.

Stage III. Head scarcely bilobed, erect, pale luteous, a linear dotted band from the antennæ to the outer side of the vertex and second faint one within; width .9 mm. Body moderate; obscure, sordid, pale, on joints 5 to 8 a small blackish dorsal spot and two small subdorsal ones; dorsal, subdorsal, lateral and suprastigmatal faint reddish lines; subventer broadly pale, feet pale. Setæ short, with rather large glandular tips; tubercles concolorous, roundedly elevated; venter obscurely reddish lined.

Stage IV. Head rounded bilobed, white, thickly mottled with brown dots, leaving a vertical band of the ground color on the face of the lobe and one up from the eye, between which the dottings are darker; width 1.3 mm. Body moderate, the central segments not over one-third longer than broad, smooth. Light brown, the ground yellowish, mottled with purplish brown. On the central segments a black patch anteriorly and before tubercle ii and a small subdorsal one just above ii. Faint addorsal, subdorsal and lateral dotted pale lines. Stigmatal region broadly pale, sharply limited above on joints 10 to 13, with a conspicuous black patch on the base of the foot of joint 10 before. Subventral and adventral pale lines with dark shading between them. Feet pale, tubercles white, setæ short, brown. The dorsum of joints 9 and 10 is broadly pale, as also joint 5, but less conspicuously.

The larvæ are probably somewhat general feeders on low plants. They were given *Polygonum* and *Epilobium*. Larvæ from Kaslo, British Columbia.

THE BEDBUG, *CLINOCORIS* (=*CIMEX*=*ACANTHIA*=*KLINOPHILOS*) *LECTULARIA* LINNÆUS.

Part I. Life-history at Paris, Texas, with Biological Notes, and Some Considerations on the Present State of Our Knowledge Concerning It.

BY ALECANDRÈ ARSÈNE GIRAULT, WASHINGTON, D. C.

Although the habits and life of this abominable inhabitant of the dwellings of man are now tolerably well known, yet, there remain certain points in its economy which are still open questions to us. The writer does not intend to go into these very fully, but first offers some detailed notes obtained from observations made from time to time on this insect, and then tries to point out certain important, neglected phases in its life-history.

Hitherto, authors, excepting a few, have seemed inclined to rush hurriedly over the discussion of this insect, as if ashamed, and hence it has been, comparatively speaking, much neglected. It is *the* insect most directly affecting man, and the one, if any, which should be thoroughly studied, and yet, not until as late as 1896 (Marlatt, 1896 a) was its true life-history made known. After giving the following detailed notes, which may be of interest, the writer will enter a little more fully into this subject. The observations, unless otherwise stated, were made at Paris, Texas, about 33° 45′ north latitude, and though of secondary importance, they are thus detailed because definiteness on all points in the life-history of the bedbug is evidently lacking.

As the food-supply is the factor directly determining the lengths of the instars in this insect, it is *apparently* true that climatic conditions have very little significance in this respect; for any single instar in its postembryonic development may be indefinitely prolonged by the total absence of food, or may be varied at will by giving food at variable time-periods in the different instars. But, under what may be called normal conditions, in which the insect is attending a constant host, and hence, is having an optimum amount of food, the climatic conditions must necessarily influence the length of the different instars, and therefore a life-history to be at all representative must be taken when under such conditions.[a] For it is well known that the preparatory stages of ecdyses are much lengthened by cold, and much shortened by heat, most easily seen in lepidopterous larvæ. Under so-called normal conditions, then, climate would noticeably influence the length of the instars.

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[a] Compare foot-note in seq.

Egg.

1. *External development.* Five (5) eggs deposited during the evening 22nd June, showed no external changes until the morning of June 24th, when they were shaded by the yolk mass. At 8 A. M., 25th June, the embryo was plainly visible, showing buds of the appendages, the body segments, and the reddish eyes. On morning of 28th June they hatched without further changes.
2. *Length of instar.* Two observations made on a total number of thirty (30) eggs during the last two weeks in June averaged 5 days, 12 hours. Eggs confined indoors.
3. *Number deposited.* See adults.

Nymph.

1. Description of stages.

I. Length, 1.45 mm. Whole body pale, sordid yellowish-white, much paler at exclusion; eyes bright red; a dark, transverse, sub-arcuate dash on dorsum of caudal abdomen, sometimes confused; head and portions of thorax darker, subfuscous. Deep red after feeding. Antennæ 4-jointed. From many specimens, 12 hours after exclusion.

II. Length, 2.10 mm., variable. The same; sordid yellow, discus of abdomen dark from food; eyes darker; abdomen flat, depressed, wider than in I.

III. Length, 2.50 mm., variable. The same; uniformly luteus, the discus of abdomen darker from food, its margins lighter; eyes dark; abdomen oval (dorsal aspect), depressed, much wider. Exuvium entire, sordid white.

IV. Length, 3.00 mm., variable. The same; body slightly darker.

V. Length, 3.80 mm., variable. The same; body entirely fuscous. Description from 3 specimens, made immediately after ecdysis.

2. Development.

A. A single nymph or larva hatching during the morning of June 24th and isolated in a small glass vial, was fed at once. It was very active after hatching, and at first made attempts to escape, though in a few minutes readily took food. Just as soon as the least bit of blood entered the body it could be traced to its destination, and as more was sucked in, the body became stained a very beautiful, deep, purplish red. The abdomen, at first flat and round in outline, soon became distended, lengthened, and cylindric, and the nymph then measured 2.00 mm.[a]

On the afternoon of the next day (25th), the nymph was again fed, and the abdomen was much darker, not stained as previously. Again on the morning of July 1st, it was fed. It had not changed. On the morning of July 6th, it fed long and eagerly, until the abdomen became so large and distended that it was all out of proportion to the rest of the body; it was then stained purplish red, as after the first meal. The insect after this gluttonous meal did not lose its usual activity. The first molt then occurred about 7 P. M., 7th July. It had thus fed four (4) times during the first instar.

In the second instar, it was fed for the first time at 9 P. M., 9th July but took but very little food, showing an inclination to wander and hide, and was evidently much disturbed by the strong lamp-light in the laboratory. But at 4 P. M., 13th July, it went eagerly to food, remaining as before, until the abdomen became immensely swollen, and deep cherry red. It measured after this meal, 2.5 mm. The following night, it refused to feed, and afterwards, molted for the second time at 4 P. M. July 16th.

During the third instar, the nymph was offered food at 9 P. M., 18th July, but took little or nothing. At 8 P. M., 22nd July, however, it was finally induced to feed until gorged. It then measured 3.00 mm. The third ecdysis occurred at noon, 29th July.

At 9 P. M., 29th July, it was fed for the only time in the fourth instar, measuring after this meal 3.85 mm. The fourth ecdysis occurred at 7 P. M., 2nd August, and in the fifth instar, the single meal was given at 9 P. M., 6th August. After this very long meal, the insect measured 4.85 mm.

It became adult about 6 A. M., 11th August, much smaller than its parent, and lived in confinement with food until October 8th following.

B. Another nymph hatching during the morning of 28th June, and confined as in foregoing, was fed for the first time on July 9th, or ten days after exclusion. It then molted during the evening of July 12th, and was again fed at 8 P. M., 14th July. Length after ecdysis, 2.1 mm.; after feeding, 2.5 mm. The second molt occurred at 4 P. M. 14th of July, and food was again taken at 10 P. M.; 18th July, for the only time in the third instar. Length after ecdysis, 2.75 mm.; after feeding, 3.2 mm. The third molt occurred at 6 P. M., 22nd July, and food was given three (3) hours afterwards, though with much trouble, for attempts to escape were persistently made, the insect being annoyed by the strong lamp-light. When shaded from the light, it soon went to food; this was repeated a second time. Once at food, the presence of light, apparently, did not annoy it. Length after third ecdysis, 3.25 mm; after feeding, 4.3 mm. It was showing signs of approaching ecdysis at noon, 26th July, and molted a fourth time at 7 A. M., 28th July.

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[a] The measurements of this insect agree with those given under description of the stages, and therefore the increase in size from feeding can be calculated.

In the fifth instar, it was fed at 9 P. M., 29th July. Length after ecdysis, 4.3 mm.; after feeding, 5.00 mm. The final (fifth) ecdysis occurred on the morning of August 3rd. Length after ecdysis, 5.00 mm. It died in confinement without food on 13th September.

It is apparent from this, that measurements of length after a full meal, approximate the length of the insect after the ecdysis following this meal. For example, a nymph measuring 5.0 mm. after a full meal in instar V, would measure approximately 5.0 mm. when adult. It is also indicated that more food is needed in the first instar, than in the rest. A single meal suffices, apparently for all instars after the first, a conclusion drawn from four (4) individuals reared during different periods throughout the season of 1904.

3. Length of instars.

The following table, summarizing the instars of four individuals, represents durations of stages under optimum conditions, under fair conditions, and under adverse conditions, when the food supply is highly inconstant and variable. A, under optimum conditions, having a constant host, was fed as soon as possible after each ecdysis, as the nymphs naturally do, if possible. B and C, under so-called fair conditions, were fed at shortly varying time periods, representing an intermittent host; they were fed at the same time, until in instar III, C refused food, and thus dropped behind. D, under adverse conditions having a periodical host, was fed at greatly varying time-periods, at first, more for the purpose of causing very unequal instars to show the relation of food supply to development, than for anything else, and was afterwards included in this table.

Table of instars of four individuals, the food-supply variable.

	Hatched A. M., 24th June.				Hatched A. M., 28th June.												
Instars	A*				B†				C				D				Ecdysis
	Days	Hours	Molts	Meals	Days	Hours	Molts	Meals	Days	Hours	Molts	Meals	Days	Hours	Molts	Meals	
First	13	10	7 p. 7 July	a. 24 June p. 25 June a. 1, 6 July	14	12	10 p. 12 July	9 July	14	12	10 p. 12 July	9 July	35	0	a. 2 Aug.	9 p. 14 July 9 p. 29 July	1
Second	8	21	4 p. 16 July	9 p. 9 July 4 p. 13 July	3	18	4 p. 16 July	8 p. 14 July	3	20	6 p. 16 July	8 p. 14 July	6	0	a. 8 Aug.	9 p. 6 Aug.	2
Third	11	20	Noon 28 J'y	9 p. 18 July 8 p. 22 July	6	2	6 p. 22 July	10 p. 18 July	9	18	Noon 26 J'y	10 p. 18 July 9 p. 22 July	36	12	10 p. 13 Sep.	9 p. 8 Sep.	3
Fourth	5	7	7 p. 2 Aug.	9 p. 29 July	5	13	7 a. 28 July	9 p. 22 July	22	0	17 Aug.	9 p. 13 Aug.	13	20	6 p. 27 Sep.	10 p. 23 Sep.	4
Fifth	8	11	6 a. 11 Aug.	9 p. 6 Aug.	6	0	a. 3 Aug.	9 p. 29 July	28	0	14 Sept.	9 p. 8 Sep.	66‡	18‡	Noon 3 Dec.	9 a. 17 Nov.	5 (adult)
Sums	48	8		10	35	21		5	78	2		6	156	2		6	

* Cf. A. ante.

† Cf. B. ante.

‡ Approximated.

Note.—a. and p. stand for A. M. and P. M. respectively.

A, although under optimum conditions, and cared for better than the others, did not reach its full growth until thirteen (13) days after B, which was fed less frequently. This serves to show, that no matter what the conditions, even if uniform for many individuals, the instars would vary considerably for the individuals. If comparisons are made with the foregoing, however, it will be seen quite readily, that the difference between A and B is due to difficulty in feeding A, owing to the latter's individual incapability of taking sufficient food at a single meal[a].

4. Feeding habits; some considerations.

The nymphs are very voracious, and at a single meal gorge themselves until unable to hold more. The time therefore given to each meal is limited by the capacity or size of the nymph at the time of any one meal, the capacity of course depending upon, or rather being more or less bounded by, the different instars. Hence, in each instar, the time taken for any single meal is more or less definite, shorter in the earlier, longer in the later instars, as the capacity is less in the earlier, greater in the later instars.

For its first meal after hatching, in instar I, it requires on the average, about three (3) minutes to glut itself, and if another meal is taken in this instar, a slightly longer period. In instar II, five (5) minutes; in instar III, six (6) minutes; in instar IV, eight (8) minutes; in instar V, ten (10) minutes, and when adult, from ten (10) to fifteen (15) minutes. These may be taken as averages, as the time for individuals varies somewhat.

As the nymphs very rarely take more than a single meal during an instar, probably being unable to do so, in many cases, before developmental processes hurry them on to another ecdysis, and as the adults are apparently unable to feed again after a full meal for at least forty-eight (48) hours, it is strongly indicated that visits to the host are limited in point of time to that consumed in obtaining a full meal. This varies, as has been shown, from three (3) to fifteen (15) minutes according to age.

Limited observations covering a period of three years would seem to confirm this comforting fact, but it cannot be stated as a definite certainty. It is, however, in the writer's opinion, highly probable. But if the bugs are at all numerous, the generations being considerably mixed, the host would doubtless have visitors each night.

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[a] The length of time required to rear these two nymphs compares favorably in regard to climate, with the 49 days required for those reared at Washington, D. C. See Howard (1901.)

As the writer could not conveniently obtain a suitable substitute-host to supply the necessary amount of blood upon which to rear these insects, he was forced himself to feed them from portions of the forearms, and from the hand and tips of the fingers.

When punctures were made on the upper portion of the forearm near the wrist, neither pain nor swelling resulted. But in the case of the adult, and nymph V, a distinct itching sensation was felt, somewhat like prickly heat but the other symptoms of inflammation did not appear. The itching was hardly noticable, even though the cause was certain. As far as the writer is concerned, therefore, no indications of attack are present. And this is so with others.

On the other hand, many persons know at once when these insects are present, from the intolerabble itching which ensues from their attack, and from the inflamed spots which afterwards appear. It is evident that this latter class forms but a small proportion to the whole, a conclusion drawn from the known prevalence of this pest in really respectable places, and from the indifference which is shown to its presence.

5. Length of life in confinement without food.

Thirty (30) nymphs, hatching on the morning of June 24th, and at once confined in a dry glass vial, cork-stoppered, measuring 2.5 cm. long by 1 cm., lived until the 2d of August, or thirty-nine (39) days. Two (2) nymphs hatching during the night of 22nd of June, and confined in a larger glass vial (4.5 cm. by 1.cm.) lived until the 26th of August, or sixty-five (65) days. Both lots were confined in the laboratory, where the temperature ranged a few degrees lower than natural.

Adults.

1. History and oviposition.

Two fully fed females, taken from an old wooden bedstead, in an apartment house, were confined at 10 P. M., 17th June, separately, in small pill-boxes. One was fed, the other not. The first gave rise to the nymphs in foregoing. The other deposited but very few eggs and soon died.

The record of deposition, and the effect of feeding on the number of eggs deposited, is tabulated for convenience, as follows.

Record of oviposition of two females, confined at 10 P. M., June 17th, when fully fed.

A—Fed				B—Unfed		
Date	No. Eggs	Meals	Length life	Date	No. Eggs	Length life
18–21 June	34			18–21 June	2	
21 "	1			21–22 "	2	
22 "	5	22 June		22 "	1	
24 "	1			23–27 "	2	
29 "	2	29 June				
1–6 July	5	6 July				
7–9 "	7	9 July				
9–12 "	18					
12 "	5					
13–16 "	3					
18–22 "	2	18 July				
22–24 "	8					
28 "	11					
30 July–5 Aug.	3	29 July				
8–12 "	3	6 August				
19 "	3	13 August				
6 Sept. Died	111 eggs	8	81 days	12 July died	7 eggs	24 days

Thus, the effect of food on the rate of ovisposition and also on the length of life is plainly indicated, but from the fact that but two individuals were used, nothing conclusive can be drawn.

It would also seem to indicate that but one principal brood occurs through the season, or that the females continue to lay at periods during the main breeding season, as in the case of *Anasa tristis.* It may be noted that these females when captured had already deposited some of their eggs.

2. Length of life in confinement with and without food.

It is often mentioned that these insects can survive for months without known food. This has been established by confining single specimens in closed vials or boxes, and leaving them undisturbed. Writers disagree on this subject, and extended breeding experiments are necessary before it can be definitely settled.

But few observations were made bearing on this, but it may be well to put them on record in this connection. A fully fed female, confined after capture, in a closed pill-box, lived twenty-four (24) days without food, during June and

July. Another; full-fed in instar V, but starved after the final molt on August the 3rd, died on September 13th after living forty-one (41) days. At Blacksburg, Virginia, in 1902 an adult confined in an ordinary pill-box, as in the foregoing, and kept in a cool room in a laboratory, live seventy-five (75) days without food, from August to November. Here, low, fall temperatures doubtless lengthened its life.

With food, a single (1) fertile female lived in confinement eighty-one (81) days, from June to September; it was captured in an an infested bed, and had evidently been adult for several weeks prior to capture. Another, reared in confinement, lived as adult with food, from August 11th to October 8th, or fifty-nine (59) days.

At Blacksburg, Virginia, an adult confined as usual, and fed once at the end of the first thirty (30) days, and from thence unfed, lived two hundred and fifty-nine (259)days or about eight and a half months. This was from August, 1902, to May, 1903. Low temperatures, again, doubtless account for this great increase in length of life. The insect was numb for a greater part of the time, and several weeks before its death declined food, apparently unable to take it. (Cf. DeGeer, 1773, pp. 304–305).

From these records, though meagre, and from other considerations, the writer cannot help thinking that this insect lives normally but a single season as adult, or that it is single brooded in habit. Professor Herbert Osborn, in a letter, informs me that this is also his belief.[a] The important fact apparently indicated, is that the activly reeproducing males and females survive but the actual breeding season and do not live over the following season, at least to continue reproduction. These of course, are but suggestions, and cannot be at present fully substantiated.

3. Feeding habits in confinement; general notes.

Nothing of importance was noted in regard to feeding habits, excepting perhaps that females when once full-fed, were unable or unwilling to feed again within thirty-six (36) hours, or longer.

As very many *definite* statements have not been published concerning the general habits of the bedbug, a few notes in this respect may not be amiss in this connection. The writer had some very unpleasant experiences with these insects during a summer's stay in a small town in Virginia. The whole place was thoroughly infested, and it was not an uncommon thing to see mattresses and bed-slats turned out to air, which were literally white with the insect's eggs. The writer's room was as bad as the rest; the old-fashioned bedstead was full of them, while during the day scores of them could be detected hiding in the walls. The place was almost unbearable, for the insects were not satisfied in staying indoors, but were frequently found secreted in one's clothes. One night, returning to the room from outside, two were found beneath the collar, while occasionally, one would be found hiding within a pamphlet which was carried in my pocket. Wherever they were very numerous, many could be found frequenting privy-houses or other similar places, where they would be sure to obtain an occasional meal, visiting the host at every chance, night or day. That these insects are very active and freely move from place to place, that is to say, not necessarily confining themselves to certain rooms or houses, and hence not directly dependent upon any one host, is evidently true. Mr. William F. Fiske informed me that when stationed at Tryon, North Carolina, while working in the laboratory at night, bedbugs would crawl along the under sides of the edges of the table and stealthily approaching his bared arms, would attempt to feed.

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[a] January 30th, 1905. Others have also stated this (Lugger, 1896) though giving no data upon which it is based.

At Washington, D. C., bedbugs were active during December, 1904, until January, 1905. Nymphs in instar I, were found concealed within clothing hanging in a closet; they were active and had been feeding. Adults and large nymphs, recently fed, were also found during those months[a]. During the last week in December, 1904, adults were observed in the middle of the night crawling from their hiding-places in the walls of a brightly lighted room, evidently in search of a host. On another occasion, about the same time, an adult was surprised in the act of visiting a host at 7 P. M., in a warm and very brightly lighted room. It was feeding from the side of the face, and darted quickly away when the host stirred in his sleep; it was found to be well gorged with blood. These observations were made in supposedly respectable boarding-houses, where the presence of this insect was unknown, or at least not commented upon, by the other guests.

Some important neglected points in its life-history.

1. Its relation to Man from medical and sanitary points of view.

Professor Herbert Osborn, in a letter dated January 30th, 1905, says,

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[a] Southall (1730) makes the following, original observation: "And I have seen, and do assert, they do bite in the cold as well as hot seasons." p. 28.

"It is quite remarkable that so little accurate and positive knowledge is available regarding an insect that is so universally distributed. I have brought out in class lectures the probability of the transmission of diseases by this insect, but do not recall references or definite recorded instances proving any such distribution."

The inoculation of the host with virulent blood diseases by this insect, seems to the writer to be of the highest possible degree of probability, and of the greatest importance to the people at large; and yet up to the present time nothing very definite is known, or has been done (excepting negative experiments) in the way of clearing up this point. But comparatively few references to anything of the kind could be found. A most interesting article was published in the Medical Record (Dewèvre, 1892) and is quoted in Insect Life (Riley and Howard, 1893 a).[a] The baccilli of tuberculosis were found in bedbugs attending a tuberculous host, who slept in a bed formerly occupied by his brother who died of the disease The host was observed to have been bitten by the insects in question. The room excepting the bed had been throughly disinfected. Although suspicious, nothing conclusive is proven by this, as the second host may have contracted the disease in other ways under such circumstances, as for instance from dried sputum on the bed, or from direct association with his brother.

It is not the writer's intention to go further into such considerations, but simply to call attention to the great importance of this question from medical and sanitary points of view. It is just as easy, if not easier, to conceive of the transmission and inoculation of highly dreaded blood diseases by bedbugs, as it is to conceive of the transmission of yellow-fever and malaria by mosquitos (*Culicidæ*), or of the spread of disease germs by houseflies (*Musca*). And these latter have been definitely proven. Then is it not fair to suppose that, taking into consideration the much closer interrelations of insect and host and the former's great abundance, universal occurrence, and constant presence[b], bedbugs have a much greater part to play in the spread of highly contagious diseases than do either mosquitoes or flies? That is a question that should be answered as soon as possible, and especially by the medical profession[c].

2. Other unknown, neglected, or indefinite points in its life-history.

For the sake of brevity, these will be passed over as rapidly as possible. The number of annual generations has not been definitely settled, and very little is apparently known in this respect. It will be a rather difficult point to decide from the nature of the case, and is not of great importance, economically.

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[a] And also stated by Alleger (1894).

[b] As for instance, in the slums of cities and in brothels.

[c] Vide Craig (1898), Titkin (1897), and the references given by them, and cf. the very important historical and original papers by Nuttall on this subject.

Adult length of life, and especially in regard to the two sexes, is a much mooted question, and is always confused with longevity or mere existence without known food. It is used here to include actively breeding adults under normal conditions. The male is supposed to take no food (Curtis, 1835), or at least no blood. Nothing is known of this.

In regard to longevity, many theories have been promulgated to explain or account for it. Food other than human blood is supposed to account for it, and also cannibalism. Yet, how did the specimens which DeGeer (1773) confined for over a year in a "sealed bottle,"[a] obtain juices upon which to subsist? Or those confined in closely-fitting paper boxes, such as ordinary pill-boxes? All authors[b] agree in stating that they can exist for many months without known food, but when citing instances, as for example, their supposed occurrence in large colonies in houses which have been long unoccupied, always theorize in regard to some food in order to account for it.

The lack of definite statements in regard to such occurrences, precludes further discussion. It is obvious that such infested houses would have to be isolated, or else the insects would move to others. It is also obvious that such occurrences can be accounted for by confusion with other closely allied species of *Cimex*, or in the case of new-comers, by unconscious transportation of the bed-bugs themselves. DeGeer (1773) has proven that the insects can exist for many months without food, and this is an easy way in which to explain the matter. If the insects were cannibalistic, obviously, large colonies would not thus be found. The confusion exists because of the lack of details. Their food-habits are thus left in obscurity, under the conditions spoken of, together with the question of longevity.

It may be of interest to quote Lintner (1885) as a case in point. A correspondent wrote as follows: " 'Will you tell us something about the bed-bug, what its habits are, when it "spawns," what it eats, how long it lives, and if it ever dies? I ask because I have moved into a house that I find was already occupied by several colonies of the pest. The room in which I have my library has the most. They are in my files of papers and periodicals. They seem to grow fatter every day, but for the life of me, I cannot tell what they live on. * * * * * * *. Can it be that they live on the paste on the wall paper? As for remedies, * * * * * *. The latter (red pepper), I have sifted through my papers and books, and wherever I could get it; but instead of driving them off, they seem to fatten on it; * * * * * * * * * * * * * * * *. * * * *.'" pp. 16–17.

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[a] Quoted from authors. In reality, the insects were kept in a sand-box (*un poudrier*) presumably those used DeGeer's time to sprinkle writing with sand in order to dry it. It should also be noticed that the insects lived most of the time during the winter or cold months. Southall (1730) states that they feed on oak, walnut, cedar, etc., and in his recommendations, tells us that such woods should be avoided about dwellings.

[b] Excepting Dufour (1833).

This appearance of the insect in an unoccupied (i. e., not a sleeping) apartment, is apparently explained by Lintner, by the fact that they obtained nourishment from moisture in the paste on the wall, or, and so forth. But as the insects were stated to be fat,[a] it is evident that they were merely hiding in the books and papers by day, and visiting the hosts by night, or whenever a chance offered. Their occurrence in an unoccupied house may be explained in many ways, and may not have been of long duration. Lack of details, such as the appearance of the insects when found, whether fat or thin, dark or light, the conditions under which found, and so forth, makes positive conclusions impossible.

An appropriate quotation also may be taken from Dr. Howard (1901), in which it is to be noticed that no reference is made to a questionable supply of food when referring to longevity. He says: "It has gained the power of subsisting almost indefinitely without food, waiting for its meals with a patience far surpassing that of Job." p. 289. And then again: "And then, too, from the ability which the bedbug has of undergoing prolonged fasts, it may be found alive not only in houses hich have been deserted for a long time, but about old deserted camps in the woods." p. 290.

The period of oviposition and the number of eggs deposited are also unknown, especially the latter. Southall (1730) stated that eggs were deposited about four (4) times during the year in batches of fifty (50), and he has evidently been followed up to the present time. Riley (1887), a century and a half later, states that the female deposits about fifty (50) eggs in March, May, July and September, but does not give a more definite statement, aud is apparently following Southall. Butler (1893) says the same, indirectly quoting Southall, and this statement has been copied quite generally. Further than this, nothing has been done.

It may be well to call attention to the fact that no true parasites have been recorded as attacking the bedbug, though it would not be at all surprising if such were found attacking the egg, which are more exposed than the later stages. It has been a long accepted fact that none were present, and later writers, under such circumstances, may have easily overlooked minute egg-parasites. Its anatomy has been well worked up (Landois, 1868; D'Herculais, 1886; and others.)

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[a] It can hardly be believed that these insects would be fat, if nourished on moisture alone. When deprived of blood for long periods, they become thin and transparent, or at least much lighter in color, even in the presence of moisture.

The trouble then is, that definitely stated facts are wanting concerning much of the life-history of this pest. This has doubtless been caused, partly on account of its being so common everywhere, and having an extensive literature, thus causing modern writers to believe it at first glance to be well studied, and partly because of its odious character and abominable nature. The last cause seems to have the most to do with it.

For those who may want to look fully into the questions suggested, a full bibliography of the literature is appended to this paper. This has been made as complete as possible, and on account of its length, will follow as part II. It is hoped that the list of titles given, will be found very complete and accurate, the writer having made it a point to correct the many erroneous references existing and to verify those which have been found to be correct. The bibliography will be explained, the titles criticised and credit given in their proper places.

Thanks are here extended to Dr. L. O. Howard, Chief of the Bureau of Entomology, United States Department of Agriculture, for permission to publish these notes; and for other kindnesses.

SYNOPSIS OF THE TIPULID GENUS BITTACOMORPHA

BY CHARLES W. JOHNSON.

This interesting genus is very widely represented by the more common and conspicuous species *B. clavipes* Fabr., which extends throughout Eastern North America from the Atlantic to the Rocky Mountains. All the records from the Pacific Slope undoubtedly refer to *B. occidentalis* Aldrich (Psyche VII, p. 201, 1895) and Osten Sacken (Psyche VII, p. 230, 1895). The *B. sackenii* described by von Röder from Nevada (Wiener Entom. Zeit., Heft 8, p. 230, 1890) has also been recorded from Seattle, Washington, by Aldrich and re-described by him in Psyche VII, p. 200. A specimen from the mountains of North Carolina adds another species to our fauna.

TABLE OF SPECIES

1. Tibiæ annulated with snow white near the base. 2
   Tibiæ not annulated, all the metatarsi white at the tip instead of the base. *sackenii* Röder.

2. Metatarsi more or less swollen. 3
   Metatarsi not swollen in the slightest degree, nor annulated at the base, and only those of the anterior tipped with white. *jonesi* n. sp.

3. Dorsum of thorax deep velvety black with a white median line. *clavipes* Fabr.
   Dorsum of thorax shining black, the white median line wanting. *occidentalis* Aldr.

Bittacomorpha jonesi n. sp.

♂ Head blackish, front and face covered with a silvery white pollinose; antennæ about 4mm. in length, the two basal joints brown, the remainder black and strongly pubescent; palpi and proboscis yellowish. Dorsum of the thorax shining black, the remainder of the thorax including the scutellum dull yellow, slightly darker on the pleuræ; humeri, a lateral stripe extending to the base of the wing and pleuræ silvery white pollinose. Abdomen clavate, black, shining, posterior margins of the second, third and fourth segments, and the genitalia yellowish, the claspers black. Coxæ light yellow, base of the femora brown becoming gradually black toward the end; tibiæ black, annulated with white near the base; anterior metatarsi tipped with white, the others entirely black; the second and third joints of the tarsi white, the terminal joints black; halters dark brown. Wings grayish hyaline, the relative length of the second submarginal cell the same as in *B. clavipes.* Length of body 8mm., of wing 7 mm., and of the posterior legs 15mm.

One specimen from Mt. Taxoway, North Carolina, at an elevation of between 3000 and 5000 ft. Collected in August, 1904, by Mr. Frank M. Jones of Wilmington, Delaware, to whom I dedicate this interesting species.

Varying Abundance of Certain Butterflies. Many collectors of butterflies in New England have noticed the remarkable scarcity of *Anosia plexippus* during the last five or six summers, but little or no mention of this phenomenon has appeared in print. Since 1899 I have found it impossible to obtain supplies of larvæ for class-room use, where previously the species had swarmed. In Alstead, N. H., the almost total disappearance of the species was remarked even by non-entomological observers. In 1899 it was common; in 1900 hardly a specimen could be found. Last year a diligent search revealed four of them in a region where they used to abound.

Current comment among members of the Cambridge Entomological Club suggests that *Aglais milberti* is rapidly increasing in abundance, particularly in eastern Massachusetts. My own observations seem to support this idea.

Laertias philenor appears occasionally in great numbers in the neighborhood of Boston, but after a season or two of plentifulness it vanishes. Along the southern border of New England, *Papilio thoas* and *Callidryas eubule* come and go. The range of each species widens and shrinks and widens again in response to certain changing conditions, but our knowledge of those conditions is very fragmentary. It would be interesting to compare a large series of observations, and perhaps such a comparison would help us to a better understanding of the struggle for existence among the butterflies.—W. L. W. Field.

RECENT ENTOMOLOGICAL LITERATURE.

A CATALOGUE OF NORTH AMERICAN DIPTERA. BY J. M. ALDRICH. (Smithsonian Miscellaneous Collection, Vol. XLVI, Pages 1–680, 1905.) About twenty years have elapsed since the publication of Baron Osten Sacken's catalogue of the North American Diptera. A catalogue such as the author now presents is one of the greatest *stimuli* to the study of any group, and it should be possible to have such works bearing on all of the orders published more frequently.

This work has the same faunal limits as the Osten Sacken catalogue of 1878, *i.e.* south to Panama and including the entire West Indes.

The first and natural question to be asked was, "How many species are there in the new list?" This I could not answer, for double the number contained in the Osten Sacken catalogue does not convey a very clear idea of the number of species recorded, so that an actual count seemed to be the only solution; a single count, barring all synonyms and cross references, but including all "unrecognizable" and doubtful species, gave 8,191; if to this we add the species described in 1904 as given in the appendix (about 229), we have a total of 8,420 species. It would be safe to cancel the 420 and to say there are probably about 8,000 described species.

The author's loyalty to Baron Osten Sacken, who laid the foundation for dipterological study in America, is beyond question, while the following expression shows the true spirit in which a work of this kind should be produced: "I have been influenced by the feeling that my catalogue must represent the actual condition of classification not merely my own views." A catalogue is not the place for radical changes, "fixity" should be the guiding star, and it is only from this standpoint that I wish to criticise. When types exist we cannot ignore the species until the types have been thoroughly studied; because the types represent two species is no reason for dropping the name and adopting a more recent one, unless both species have been previously described; species should be selected by elimination, the same as genera. I refer principally to Miss Gertrude Ricardo's papers on the Tabanidae in the British Museum collection, published in the Annals and Magazine of Natural History, 1900–1902, and adopted by Hine in his Tabanidae of Ohio. This would make the following changes in the genus Chrysops *æstuans* V.d.W., 1867,=*mærens* Walker, 1848; *atropos* O. S. 1875,=*divisus* Walker, 1848; *fugax* O. S. 1875,=*carbonarius* Walker, 1848; *furcatus* Walker, is a good species and not a syn. of *striatus* O. S.

In the Stratiomyidae there are the following omissions: *Euparyphus major* Hine (Ohio Nat. I., 112, 1901), and *Akronia frontosa* Hine (*l. c.* 113). *Pachygaster maculicornis* Hine, belongs to the genus *Neopachygaster* of Austen.

In the Bombylidae I note the absence of *Systœchus solitus* Walker, a species which seems to be quite distinct from *vulgaris*. The name of *Hyperalonia serveillei* Macquart, presents an interesting question in nomenclature,—whether a name based on what is apparently a recognizable figure, but without a description or locality, shall be accepted. The *Bombylius philadelphicus* of the New Jersey list is a very different species from the *B. mexicanus* Wiedeman, but whether it represents Macquart's species is somewhat doubtful.

Lestomyia fallii Coquillett, and *Erax dubius* Will. seem to be omitted. *Erax albibarbis*, Macq., 1839, should be the species, not *cinerascens* Bellardi, 1861. *Holopogon philadelphicus* Schiner, is undoubtedly a synonym of *guttula* Wied. I only note the omission of *Criorhina nigra*, Will. (Synopsis, p. 214), in the Syrphidae.

A name omitted in the Dexiidae is *Metadexia flavipes* Coq. The type is in my collection, it has proved to be a synonym of *Thelairodes basalis* Giglio-Tos. We cannot blame the author for overlooking *Phorbia cepetorum* Meade, published under the title, "Annotated List of British Anthomyiidae," in the Entomologist's Monthly Magazine, March, 1882, p. 218, where he also refers to American specimens received from Professor Lintner of Albany.

I beg to differ with the author in regard to ignoring recognizable descriptions where no locality is given, noticeably, the use of *Amphicnephes pertusus* Loew, 1873, instead of *pulla* Wiedemann, 1830, and of *Ischnomyia vittula* Loew, 1863, in place of *albicosta* Walker, 1849. *Tephronota narytia* Walker, 1849, will have to be adopted in place of *ruficeps* Van der Wulp, 1867, notwithstanding the fact that of the "four specimens in the British Museum, two of them are *Chætopsis ænea* and that one of these bears Walker's label, 'Narytia'", (Osten Sacken Cat., p. 260), the description applies very clearly to the other two, and not to *C. ænea*, Wied. *Sepsisoma flavescens* Johnson, *Tephritis nora* Doane, *Ophthalmomyia bisignata* Coq., *Eudicrana obumbrata* Loew, and *Nycteribia bellardi* Rond., seem to be omitted. Considering the amount of work involved in preparing a catalogue of this kind, the omissions are very few and the author deserves all the praise it is possible to give for his careful and thorough work. C. W. J.

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Asterisks indicate descriptions of new species of American insects or of new genera.

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Osburn, R. C, The Odonata of British Columbia 5 June. **Ris, Dr. F.** Oviposition in Cordulegaster, 5 Apr. **Williamson, E. B.** Odonata . . . collected along the Rockcastle River at Livingston, Ky., 141 v, 309.

ORTHOPTERA.

Bruner, L. Some new Colorado Orthoptera*, 173 no. 94, Dec. 1904. [12 new species.] **Burr, M.** Observations on the Dermatoptera, including revisions of several genera, and descriptions of new genera and species*, 36 1904, 277. [New genera *Challia*, *Tomopygia*, *Odontopsalis*]. **Gillette, C. P.** Annotated list of Colorado Orthoptera, 173 no. 94, Dec. 1904. **Gillett, C. P** and **Johnson S. A.** The western cricket (*Anabrus simplex*): Life-history and remedies (Gillette); migratory habits (Johnson), 173 no. 101. **Hancock, J. L.** The Tettigidæ of Ceylon, 174 ii., 97. [New genera *Deltonotus*, *Lamellitettix*, *Acanthalobus*, *Loxilobus*, *Apterotettix*, *Euparatettix*.] **Rehn J. A. G.** Notes on a small collection of Orthoptera from the lesser Antilles, with the description of a new species of *Orphulella**, 5 June. **Skinner, H.** Destructiveness of the Australian roach *Periplaneta australiasiae*, 5 June. **Stevenson, C.** The Blattidae of Montreal, 5 Apr. **Walker, E. N.** Notes on the Locustidae of Ontario, concluded (Plates), 4 Apr. **Williams. C. E.** Notes on the life-history of *Gongylus gongyloides*, a mantis of the Tribe Empusides and a Floral Simulator, 36 1904, p. 125.

HEMIPTERA.

Ball, E. D. (a) New species of *Phlepsius* and related genera (Homoptera)* 4 June; (b) Some new Homoptera from the south and southwest*, 176 xviii, 117 [New genus *Scolopsella.*] **Britton, W. E.** Some new or little known Aleyrodidae from Connecticut, I (Plate)*, 5 Mar. **Bueno, J. R. de la Torre.** (a) Notes on collecting, preserving and rearing aquatic Hemiptera, 4 Apr.; (b) The tonal apparatus of *Ranatra quadridentata* Stal., 4 Mar.; (c) The three Ranatras of the northeastern United States, 4 May. **Carpentier, L.** Nervation anormales de l'*Aphalera picta* Zett., 95 xi, 12. **Cockerell, T. D. A.** (a) Three new Coccidae from Colorado*, 4 Apr.; (b) Three new South American Coccidae*, 5 June. **Distant, W. L.** (a) Additions to a knowledge of the family Cicadidae*, 36 1904. p. 667 [New genus *Hamza*]; (b) Rhynchotal notes (continued)*, 11 xv, 379 [New genera *Miranha, Orellana, Balinta, Tamasa.*] **Dodd, F. P.** Notes on the maternal in Rhynchota, 36 1904, p. 483. **Enderlein, Dr. G.** Zur Morphologie des Läusekopfes, 22 xxvii, 627. **Marchal, P.** Sur quelques Cochenilles nouvelles*, 32 1904, no. 7, p. 448 [New genus *Trabutina*]. **Melichar, Dr. L.** Neu Homoptera aus Sud-Schoa, Galla und den Somal-Landen, 44 liv, 25. **Morrill, A. H.** The greenhouse white-fly (*Aleyrodes vaporariorum*), 180 no. 57. **Osborn, H.** Descriptions of new North American Fulgoridae*, 141 v, 373 [New genus *Prokelisia*] **Uhler, P. R.** Recognition of two North American species of *Cicada* Latr.* 5 Mar. **York, H. H.** A new *Aspidiotus* from *Aesculus glabra**, 141 v, 325.

LEPIDOPTERA.

Barnes, W. New species of North American Lepidoptera*, 4 May, June: **Busck, A.** *Aristotelia youngella*, a correction, 4 Mar. **Cook, J. H.** On the specific value of *Incisalia henrici*, 4 June. **Coverdale, G.** Variation in *Callimorpha*, 5 May. **Druce, H.** Descriptions of some new species of Noctuidae from tropical South America* 11 xv, 373. **Dyar, H. G.** The types of the late Dr. Hulst 4 Apr. **Engel, H.** (a) Collecting moths in the autumn and winter, 4 Mar.; (b) A new species of *Xylina**, 4 Apr. **Gibson, A.** Note on *Simaethis fabriciana* L., 4 Mar. **Gillette, G. P.** and **Johnson, S. A.** The beet web-worm (*Loxostege sticticales*) and the beet army-worm (*Carudrina exigua*) (Gillette): Cutworms (Johnson), 173 no. 98. **Girault, A.** Standards of the number of eggs laid by insects, III: *Hemerocampa* (*Notolophus*) *leucostigma* Smith and Abbott, 5 June. **Goeldi, Dr. E. A.** Grandiosas migrações de Borboletas (*Catopsilia statira*) no valle amazonico, 181 iv, 309. **Grinnell, F., Jr.** (a) *Lycaena emigdionis* n. sp.*, 5 Apr.; (b) Butterflies of Mt. Wilson, southern California, 5 May. **Grossbeck, J. A.** Notes on the life-history of *Anthocharis genutia* Fab., 5 May. **Grundel, J. G.** Life-history of *Lemonias virgulti*, 5 Mar. **Guppy, J.** Notes on the habits and early stages of some Trinidad butterflies, 36 1904, p. 225. **Heath, E. F.** Notes on the lepidoptera of the year 1904, 4 May. **Jeheber, E.** Observations on *Papilio turnus* var. *glaucus*, 5 Apr. **Kaye, W. J.** A catalogue of the Lepidoptera Rhopalocera of Trinidad*, 36 1904, p. 159 [New genera *Syntarucoides, Polyniphes, Siderus, Iaspis, Arawacus, Rekoa, Macusia, Paiwawia*, and *Itaballia*; also 9 new species]. **Kearfott, W. D.** (a) Assiniboia micro-lepidoptera, collected by Mr. T. N. Willing, 4 Mar., Apr.; (b) *Hemerophila kincaidiella* Busck, a correction, 4 May; (c) Manitoba micro-lepidoptera, 4 June. **Lathy, P. I.** New species of South American Erycinidae*, 36 1904, p. 463; (b) On some aberrations of lepidoptera, 36 1904, p.

65. **Leigh, G. F.** Synepigonic series of *Papilio cenea* and *Hypolimnas missippus*, together with observations on the life-history of the former, 36 1904, p. 677. **Lawrence, W. H.** Some notes on the habits and life-history of *Bembecia marginata* Harris in western Washington, 5 Apr. **Manders, N.** Some breeding experiments on *Catopsilia pyranthe* and notes on the migrations of butterflies in Ceylon, 36 1904, p. 701. **Marlatt, C. L.** Report on the gypsy moth and the brown-tail moth, July, 1904, 180 no. 58. **Murtfeldt, M. E.** A new species of *Bucculatrix**, 4 June. **Pearsall, R. F.** The genus *Venusia* and its included species*, 4 Apr [New genus *Nomenia.*] **Rebel, Dr. H.** Studien Süber die Lepidopterenfauna der Balkanlander, 64 xix. 97–377. **Seifert, O.** Contributions to the knowledge of North American Arctiidae, IV (Plate), 4 Mar. **Smith, J. B.** New species of Noctuidae for 1905, No 2*, 4 June. **Swinhoe, Col. C.** (a) New species of Eastern, Australian and African Heterocera in the National collection*, 36 1904, p. 139 [New genera *Vestura*, *Xylecata*, *Pteroceropsis*]; (b) On the Geometridae of tropical Africa in the National collection*, 36 1904, p. 467 [New genera *Pseudocro:inis*, *Milocera*, *Encoma*, *Hemicopsis*, *Caradrinopsis*, *Provola*, *Gonochlora*, and *Brachytrita.*] **Turner, Dr. A. J.** A classification of the Australian Lymantriadae*, 36 1904, p. 469. [New genera *Axiologa*, *Iropoca*]. **Webster, F. M.** Note on food of *Alabama argillacea*, 4 Mar. **Williams, F. X.** Notes on the larvae of certain lepidoptera, 5 May. **Wolley Dod, F. H.** (a) Review of Dyar's Lepidoptera of the Kootenai district, 4 Mar.; (b) Preliminary list of the macrolepidoptera of Alberta, N. W. T., 4 Apr.—June.

See also Lochhead, under Economic Entomology.

DIPTERA.

Adams, C. F. On the North American species of *Oscinis**, 5 Apr. **Bischof, J.** Beitrag zur Kenntnis der Muscaria schizometopa*, 44 liv. p. 79 [New genera *Anacamptomyia*, *Parachetolyga*, *Polychnomyia*, *Empheremyia*, *Ptilogonia*, *Dewetia*]. **Britton, W. E. and Viereck, H. L.** Report on mosquito investigations in Connecticut, 177 1904, pp. 253–308. **Bueno, J. R. de la Torre.** Notes on *Mixogaster breviventris* Kahl, 5 Mar. **Coquillett, D. W.** A new *Culex* from Australia*, 5 Apr.; (b) A new Cecidomyiid on cotton*, 4 June. **Du Roselle, Dr. F.** Organes genitaux des Sarcophaga, et nécessité de leur examen pour la détermination des espèces, 95 xi, 6. **Felt, E. P.** *Culex brittoni* n. sp.* 5 Mar. **Goeldi, Dr. E. A.** Os Mosquitos no Para, 181 iv, 129. **Ludlow, C. S.** Mosquito Notes, No. 3*, 4 Mar. Apr. [New genera *Reedomyia*, *Popea*, *O'Reillia*, *Heizmannia*]; (b) A new North American *Taeniorhynchus**, 4 June. **Moodie, R. L.** A new *Milesia* from Arizona, with notes on some Wyoming Syrphidae*, 5 May.

See also Baker, under Economic Entomology, and Carpenter and Gillette, under The General Subject.

COLEOPTERA.

Arrow, G. J. Sound-production in the Lamellicorn beetles, 36 1904, p. 709. **Bates, F.** A revision of the sub-family Pelidnotinae of the Coleopterous family Rutelidae, with descriptions of new genera and species*, 36 1904, p. 249 [New genera *Mecopelidnota*, *Epichalcoplethis*, *Hoplopelidnota* and *Xenopelidnota.*] **Bernhauer, Dr. M.** (a) Neue exotische Staphyliniden*, 44 liv, p. 4; (b) Neue exotische Staphyliniden*, 45 1905, Heft I, p. 9. [New American species and a new genus, *Teras.*] **Briggs, E. M.** The life-history of case-bearers: I, *Chlamys* *plicata*, 124 iv. **Britton, W. E.** Description of the larva of *Delphastus pusillus* LeC. with notes on the habits of the species, 4 May. **Casey, T. L.** (a) A new *Carabus* and *Cychrus*, with miscellaneous notes on Coleoptera*, 4 May; (b) A revision of the American Paederini*, 175 xv, 17–248 [New genera *Aderobium*, *Eucryptina*, *Pycnocrypta*, *Cryptobiella*, *Monocrypta*, *Gastrolobium*, *Lissobiops*, *Biocrypta*, *Paederillus*, *Leucopaederus*, *Apteralium*, *Abletobium*, *Litolathra*, *Lathrobiopsis*, *Lathrobioma*, *Luthrolepta*, *Deratopeus*, *Eulathrobium*, *Lathrotropis*, *Lathrotaxis*, *Pseudolathra*, *Linolathra*, *Lathrobiella*, *Microlathra*, *Polymedon*, *Sciocharella*, *Hemimedon*, *Paramedon*, *Medonodonta*, *Oxymedon*, *Tetramedon*, *Medonella*, *Leucorus*, *Pycnorus*, *Scopaeoma*, *Scopaeopsis*, *Pachystilicus* *Stilicolina* and *Omostilicus*]. **Chagnon, G.** *Criocephalus obsoletus* Rand., and *Asemum moestum* Hald., 4 June. **Cotton, E. C.** Life-history notes on *Apion nigrum*, 141 v, 346. **Enderlein, Dr. G.** Die Taukäfer der Crozet–Inseln nach dem Material der Deutschen Südpolar Expedition*, 22 xxvii, 716 [New genera *Amblystogenium* and *Temnostega*]. **Fall, H. C.** (a) Two new species of *Aphodius**, 5 May; (b) Notes on some Californian Buprestidae*, 5 Mar. **Heller, K. M.** Zehn neue Käfer aus Neu-Guinea*, 45 1905, p. 65. [New genus *Calocerambyx*]. **Hunter, W. D.** The control of the boll weevil, including results of recent investigations, 179 no. 216. **Lea, A. M.** On *Nepharis* and other ants' nest beetles taken by Mr. J. C. Goudie at Birchip*, 178 xvii, 371 [New genera *Kershawia* and *Paussoptinus*] **Muir, F.** and **Sharp, Dr. D.** On the egg-cases and early stages of some Cassididae, 36 1904, p. 1. **Ohaus, Dr. F.** Beiträge zur Kenntnis der Ruteliden*, 45 1905, p. 81 [New genus *Macropopillia*]. **Pilate, G. R.** Note on the finding of *Ptinus fur* and *brunneus* 5 Mar. **Schaeffer, C.** Additions to the Coleoptera of the United States, with notes on some known species*, 165 i, no. 6. **Waterhouse, C. O.** Three new Coleoptera from East Africa belonging to the Lucanidae and Cetoniidae*, 11 xv, 375 [New genera *Dicellachilus* and *Bettonia*]. **Weise., J.** Aufzählung Mexicanischer Hispinen*, 45 1905, p. 130. **Wickham, H. F.** New species of Coleoptera from the western United States, second paper*, 4 May.

See also McCracken, under The General Subject.

HYMENOPTERA.

Ashmead, W. H. A new *Pezomachus* from Italy, 4 Apr. **Cameron, P.** New Hymenoptera mostly from Nicaragua*, 142 i, 46 [New genera *Kareba*, *Plagiosmicra*, *Platychalcis* and *Rekabia*]. **Cockerell, T. D. A.** (a) The bees of the genus *Nomada* found in Colorado, with a table to separate all the species of the Rocky Mountains*, 173 no. 94, Dec. 1904; (b) The Halictine bees of North America*, 3 Feb. [Review of paper by Vachal]; (c) Three new bees from the southwest*, 5 Mar.; (d) Some bees of the genus *Nomada* from Wisconsin*, 4 May. **Ducke, A.** Sobre as Vespidas sociaes do Para (Brazil)*, 181 iv, p. 317 [New species and one new genus, *Megacanthopus*]. **Enderlein, Dr. G.** Zur Klassifikation der Evaniiden*. 22 xxvii; 699. [New genus *Evaniellus*]. **Fernald, H. T.** The type of the genus *Sphex*, 5 June. **Kieffer, J. J.** Descriptions of some new Hymenoptera from California and Nevada*, 142 i, 41. **Mayr, Dr. G.** Hymenopterologische Miszellen*, 44 liv. p. 559 [New genus *Psychophaga*]. **Morice, Rev. F. D.** Illustrations of the male terminal segment and armatures in thirty-five species of the Hymenopterous genus *Colletes* 36 1904, p. 25. **Nason, W. A.** Parasitic Hymenoptera of Algonquin, Illinois, 5 May, June.

See also Cook, under Economic Entomology, and Phillips, under The General Subject.

ANNOUNCEMENT.

In order to facilitate a return to the former practise of publishing PSYCHE on the first day of the month of publication, the June and August numbers have been combined in this double number, appearing August 1. Henceforth it will be the aim of the Publication Committee to adhere to the old rule.

Correspondents are asked to take notice that henceforth all material for publication in a given number must be in the hands of the Editors on or before the first day of the month preceding the month of publication.

ENTOMOLOGEN ADDRESSBUCH.—By W. Junk, Rathenower Strasse 22, Berlin. N. W., Germany.

Considering the field covered by this work, viz:—the names and addresses of the leading entomologists throughout the world, it is certainly very creditable to the author, and the most complete Directory along these lines which has been published. Not only are the names arranged under countries, but also alphabetically, which adds to its value and convenience. There are over 400 pages, 114 of which are devoted to a catalogue of numerous new and second-hand books, for sale by the author. H. H. N.

The address of Mrs. A. T. Slosson will hereafter be 83 Irving Place, New York City, instead of 38 East 23 Street, as formerly.

EXCHANGES.

[Exchange notices (not over five lines) inserted free for subscribers. Notices will be inserted in the order in which they are received, and those at the top of the column will be removed only when it is necessary to make room for new ones at the bottom]

AMARA. Being engaged in the study of this genus, I will determine specimens for collectors. These should be sent numbered. I am also anxious to obtain species in other genera of Carabidae not in my collection, from all parts of the world, and will purchase or exchange for same. Roland Hayward, Readville, Mass.

WANTED—Eggs, larvae or pupae of grasshoppers, dragon-flies, beetles, bugs, etc. Will give tropical butterflies in exchange. Denton Bros., Wellesley, Mass.

WANTED—Material for the study of the hybrid or polymorphic butterflies of the genus *Basilarchia*, including larvae or pupae of *arthemis* or *astyanax*, imagos of *proserpina* or *arthechippus* or any specimens showing unusual characters. Liberal exchange. Specimens retained will be deposited in Museum of Comparative Zoology. W. L. W. Field, Milton, Mass.

LEPIDOPTERA—For exchange, fertile eggs of *Hemileuca maia*. Alfred C. Sampson, Sharon, Mass.

I have a few specimens of *C. calleta* and *cinctus* to exchange for rare *Sphingidae* or Pupae of same. W. T. Buxton, 17 Walter St.. Somerville, Mass.

WANTED—Ova, larvae or pupae of *Limenitis ursula* and *arthemis*. Will give cash or exchange. H. H. Newcomb, 35 Court St., Boston, Mass.

Will collect Diptera, Hymenoptera, Hemiptera and Coleoptera. Would like in exchange, quantities of named or unnamed Buprestidae, Scarabaeidae, Cerambycidae and Chrysomelidae. Please write immediately to G. Chagnon. P. O. Box 186, Montreal, Canada.

Correspondence desired regarding Rhopalocera of North and South America, especially Argynnis, Papilio, Morpho, Caligo. Exchange or otherwise. T. H. Shepherd, 15 Hope View, Carr Lane, Shipley, Yorks., England.

EASTERN MASS. MOTHS WANTED in exchange for same. Also, reliable colored sketches of larvæ of same. C. V. Blackburn, 101 Pine St., Woburn, Mass.

Am willing to make contracts to collect for the season, with private collectors, museums, colleges, or any public institution for insects of any order or group desired, either in large or small series. Duplicates of all orders for sale from Colorado, New Mexico, and Arizona. Correspondence solicited. Ernest J. Oslar, 4535 Raleigh St. Alcott P. O., Denver, Colorado.

TABLES FOR THE SEPARATION OF SOME BEES OF THE GENERA COELIOXYS AND COLLETES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

American Apidology is greatly indebted to Mr. E. T. Cresson for the careful description of some 540 new species of bees, this count excluding a few which are now known not to be valid, but including the species of Central America and the West Indies. There is, however, one difficulty in using Mr. Cresson's work, and that arises from the absence of tables; in some of the more difficult genera this becomes so serious that the worker is at times discouraged. Two or three weeks work would provide us with tables for the separation of all the Cressonian bees; in fact, I presume that they could be made in less time than that, but nobody has seemed willing to undertake the task. When recently spending a few days in Philadelphia I took occasion to make tables of *Anthophora*, *Colletes*, (males) and *Coelioxys* (females), and the two latter are herewith presented. Some non-Cressonian species which I found in the collection at the Philadelphia Academy are included; particularly Mr. Viereck's *Colletes* from Beulah, N. M., which have never been tabulated.

Colletes Latreille

Pubescence of thorax above deep orange ferruginous 1
Pubescence of thorax not brightly colored; males only tabulated . 2
1. Large; abdomen shining, without definite bands . . *thoracica* Smith.
Small; length about 10mm.; abdomen well banded . *azteca* Cr.
2. Malar space exceedingly long, at least twice as long as broad; pubescence above strongly ochraceous; legs dark red (Mass.) *valida* Cr.
Malar space not exceedingly long, but as long as broad, at least, or almost so (hardly so in the M. N. "*consors*") 3
Malar space short, obviously broader than long 7
3. The abundant hair of face clear white 4
Hair of face ochery or greyish-white; thorax above with some or many long plumose fuscous hairs; size larger than in the group following: flagellum all dark 5
Hair of face and thorax above strongly yellowish or fulvous . . . 6

4. Larger: flagellum not red beneath; hair of thorax above ochraceous; stigma dark brown; second submarginal cell broader (La Jolla, Calif.) *gaudialis* Ckll

Smaller: flagellum red beneath; hair of thorax above white; stigma ferruginous; second submarginal cell narrower. (Las Cruces, N. M.) *prosopidis* Ckll.

5. Malar space a little longer than broad; mesothorax with much dark hair; abdomen comparatively narrow and parallel-sided *compacta* Cr

Malar space a little broader than long; mesothorax with little dark hair; abdomen broader; otherwise much like the last (Hanover, N. H.) *inæqualis* Say.

Like *compacta*, with the same transverse ridges on lower part of area of metathorax; but differing from *compacta* by its shorter malar space and shorter fourth antannal joint; differing from *inæqualis* by its narrower abdomen, smaller size, and much less yellow pubescence of thorax *skinneri* Viereck.

6. Basal (lower) margin of second submarginal cell about as long as basal margin of third: tegulae black. (Washington State) *kincaidii* Ckll

Basal (lower) margin of second submarginal cell much longer than that of third; tegulae light rufous. (New Mexico) . sp. incert. (placed in series of *consors*, but distinct from the type of that species).

7. Hair of face and thorax above all pure white, with no dark intermixed: malar space about twice as broad as long: flagellum all dark. *gypsicolens* Ckll.

Hair of face not white; or if so, that of thorax partly dark. . . . 8

8. Hair of thorax above decidedly yellow or fulvous (very pale ochraceous in *zonatus*) 9

Hair of thorax above greyish or whitish, or partly black 15

9. Hair of thorax with long fuscous hairs intermixed; abdomen strongly punctured; second submarginal cell very broad (Colorado) *simulans* Cr.

Hair of thorax without fuscous hairs intermixed; flagellum at most very faintly reddish beneath 10

10. Tegulæ light reddish, size small 11

Tegulæ dark 12

11. Hind tarsi dark like their tibiæ; abdomen less hairy (Illinois) *americana* Cr.

Hind tarsi red, their tibiæ red at base and apex; abdomen more hairy . . . . *annæ* Ckll.

12. Smaller; first abdominal segment with strong punctures; hair of face strongly yellowish; malar space extremely short (Georgia) *mandibularis* Smith.

Larger; first abdominal segment much more feebly punctured . . 13

13. First two abdominal segments extremely shiny, and not very hairy; punctures of scutellum extremely large (Georgia). . . *distincta* Cr.

First two abdominal segments not so shiny, and quite hairy . . . 14

14. Hair of thorax above fulvous; bands of abdomen ochraceous; second submarginal cell narrower, the recurrent nervure entering near end of first third. (Colorado.) . . . . *consors* Cr.

Hair of thorax above very pale; bands of abdomen white; second submarginal cell broader, the recurrent nervure entering a little basad of its middle . . . . *zonatus* Viereck.

15. Hair of thorax above without any, or any conspicuous admixture of dark hair; small species; stigma and nervures dark 16

Hair of thorax above with very conspicuous black hairs, that on the scutellum mainly or all dark 17

16. Base of metathorax more strongly sculptured, and with a transverse ridge; abdomen narrower; hind spurs light reddish . *spurcus* Viereck.

Base of metathorax less strongly sculptured, and without a transverse ridge; hind spurs dark . . . . *paniscus* Viereck.

17. Much larger; abdomen with extremely large and strong punctures *gilensis* Ckll.

Much smaller; abdomen with fine delicate punctures (Cuba) *submarginata* Cr.

Cœlioxys Latreille. (females).

Abdomen entirely red . . . . *abdominalis* Guér.

Abdomen with the first three segments red, the last three black *slossoni* Viereck.

Abdomen black, the first segment sometimes dark red 1

1. Middle of scutellum smooth, shining and impunctate (only partially so in *totonaca*, *uhleri* and *germana*) 2

Middle of scutellum densely punctured like the rest (with sparse punctures, or a small shiny space, in *totonaca*, *uhleri*, and *germana*) 11

2. Tegulæ dark 3

Tegulæ red 5

3. Abdomen not obviously banded; wings very dark fuliginous; apical dorsal segment subtruncate and strongly keeled. . . . *dolichos* Fox.

Abdomen obviously banded; wings not so dark, though apical half of anterior wings is fuliginous 4

4. Last ventral segment extending far beyond last dorsal; face with much white hair (Cuba) . . . . *uhleri* Cr.

Last ventral extending only a little beyond last dorsal; face without white hair (Cuba) . . . . *producta* Cr.

5. Thorax mainly red; last ventral segment extending far beyond the last dorsal; legs red; sides of abdomen largely red; clypeus deeply emarginate, its anterior margin like a broad W (Mexico) . . . *azteca* Cr.

Thorax not red 6

6. Last ventral segment extending very far beyond last dorsal; sides of first abdominal segment red; legs red 7

Last ventral segment extending only a moderate or short distance beyond last dorsal; or if rather far (*germana*), sides of first abdominal segment not red 8

7. Scutellar teeth short; median process of scutellum very broad and short (Mexico) . . . . *otomita* Cr.

Scutellar teeth very long; median process of scutellum long (Mexico) *tepaneca* Cr.

8. Scutellar teeth extremely short; pubescent markings of thorax above orange-fulvous (Jamaica) . . . . *foxii* Viereck

Scutellar teeth fairly or very long; legs red 9

9. Hair of sides of face yellowish; last ventral segment only slightly surpassing last dorsal; face between antennæ with a large elevated ridge (Mexico) . . . . *tolteca* Cr.

Hair of sides of face white; last ventral segment surpassing last dorsal by some distance; scutellar teeth long 10

10. Sides of first abdominal segment, and venter, red (Mexico) *totonaca* Cr.

Sides of first abdominal segment, and venter, only faintly stained with red (Illinois) . . . . *germana* Cr.

11. Tegulæ bright red 12

Tegulæ dark, black to dark reddish 21

12. Last ventral segment very broad 13

Last ventral segment rather or quite narrow 14

13. Last ventral segment fringed with short black hair, and without an apical projection (Dallas, Texas) . . . . *texana* Cr.

Last ventral segment not so fringed, and with a large apical projection (Kansas) . . . . *deplanata* Cr.

14. Last ventral segment with a strong fringe of black hair; first abdominal segment red; middle of scutellum with an impunctate line (Mexico) *chichimeca* Cr.

Last ventral segment not so fringed 15

15. Last ventral segment very narrow, not notched at sides (Mexico) *zapoteca* Cr.

Last ventral segment notched at sides, legs red (dark in *octodentata*) 16

16. Scutellum with a rather large median projection 17

Scutellum without any projection 18

17. Lateral teeth of scutellum slender (Illinois) . . . . . *germana* Cr.

Lateral teeth of scutellum broad (Mexico) . . . . . . *totonaca* Cr.

18. Last dorsal segment narrowed and strongly keeled apically, looking like a chicken's beak; size larger than *octodentata* or *altilis* (Texas) *insita* Cr.

Last dorsal not so 19

19. Larger; last dorsal long (Mexico) . . . . *mexicana* Cr.

Smaller; last dorsal shorter 20

20. Abdominal hair-bands white . . . . . . *octodentata* Say, Cresson

Abdominal hair-bands stained with yellowish . . . . . . *altilis* Cr.

(Robertson calls *octodentata* "Say" of Cresson, *C. sayi* rob., and regards *altilis* as the real *octodentata*. However, he admits that *sayi* was included in *octodentata* by Say.)

21. Last ventral ending in a very long spine, and with a very long fringe of black hair (Cuba) . . . . *uhlerii* Cr.

Last ventral not so ending 22

22. Last ventral broad, fringed with hair, and not notched at the sides 23

Last ventral notched at sides 24

23. Smaller; last ventral with a very small apical point or spine (Pa.) *modesta* Smith.

Larger; last ventral without such a point (Colorado) . *alternata* Say.

24. Last ventral very broad, abruptly narrowed, the apical process forming about an equilateral triangle; scutellum with a median tubercle (Colorado) . . . . *aperta* Cr.

Last ventral not so; sculellum without a median tubercle, last dorsal not curved upwards at end 25

25. Last dorsal, seen from above, abruptly narrowed 26

Last dorsal, seen from above, not abruptly narrowed 27

26. Part of last dorsal beyond the constriction much larger than wide (N. Y.) . . . . *dubitata* Smith.
Part of last dorsal beyond the constriction almost as wide as long (N.Y.) *comstockii* Cr.

27. Legs red (Cuba) . . . . *rufipes* Guér.
Legs black 28

28. Pubescence strongly tinged with yellow (Colchester, England) *acuminata* Nylander.
Pubescence white or faintly tinged with yellow. 29

29. Scutellar teeth moderately long; last dorsal rather short, but pointed (N. Y.) . . . . *quadridentata*, Linn. Cresson.
Scutellar teeth short; last dorsal longer 30

30. Larger; 13mm. long (N. Y.) . . . . *lucrosa* Cr
Smaller; hardly 12mm. long; abdomen more slender and more closely punctured (Connecticut) . . . . *moesta* Cr.

I take this opportunity to state that *Bombus medius* Cresson, supposed to have been collected by Suckley in Utah, is really Mexican. Prof. C. H. T. Townsend took it abundantly near San Rafael, on the Rio Nautla, State of Vera Cruz, March 8 to April 8, on six different species of flowers (his numbers 4, 15, 19, 23, 25 and 28), and I find specimens labelled "Mexico" both in the collection at Philadelphia and that at Washington.

TWO NEW MYMARIDÆ.

BY A. ARSÈNE GIRAULT, WASHINGTON, D. C.

Camptoptera metotarsa species novem.

Female. Length, 0.90 mm.

Shining black, the abdomen polished black. Legs, excepting the coxae and apical joint of tarsi, basal three-fourths of scape, and the venation, brown.

Head about as wide as the thorax, the eyes subovate, coarse, and very dark red; ocelli inconspicuous. Head and thorax coarsely shagreened, the latter short and convex, slightly longer than abdomen; parapsidal furrows absent. Abdomen depressed, short, oval. Legs long, the first tarsal joint long, the coxae rather large and coarsely shagreened, the posterior femur with a convexity or swelling in the middle of its upper margin. Wings iridescent, very slightly clouded, the fore wings narrow, curved, the marginal fringes rather long. Body nearly hairless.

Antennae elbowed, about as long as the body, 9-jointed. Scape very long, subclavate, narrowed basally, about as long, or not quite so, as the next three joints combined, or about five times the length of the pedicel. Pedicel short, very much smaller, obconic. Joints 3 and 4 slender, cylindric, 4 longer, about twice the length of the pedicel, both slenderer than the scape and pedicel; 5, 6, and 7 equal, columnar, stouter than 3 and 4, but much shorter, yet far longer than the pedicel. Joint 8 equal to 5, 6, and 7, but slightly stouter. Club cylindric, not as long as the scape, but much stouter, about equal in length to 6, 7, and 8 combined.

From a single female captured while jarring peach at Arlington, Virginia, June 2, 1905. A rather large and striking species.

Type.—No. 8941, United States National Museum.

Polynema picipes species novem.

Female. Length, 0.73 mm.

Whole body piceus black, shining; all of the legs excepting anterior coxae which are concolorous with body, basal portions of femora, and tips of the tarsi which are dusky, straw yellow. Oral area and tip of abdomen beneath pale yellowish. Femora darker than rest of the legs. Basal antennæ concolorous with legs; joints 3-6 darker; joints 7 and 8 brown; 9, or the club, piceus; the scape darker at extreme base. Eyes very dark; ocelli ruby red.

Head rounded, concaved along the face, wider than thorax; vertex roughened, front smooth. Thorax about equal to abdomen, narrow, polished, the parapsidal furrows deep and broad, the scutellum rounded posteriorly, and smooth. Postscutellum obtusely triangular, striate, separated from the scutellum by a semicircle of small foveae on the posterior margin of the latter. Abdomen regularly ovate (dorsal aspect), its tip abruptly pointed and acute, apical segment hairy at tip; polished. Segments 1 and 2 about equal, one-half longer than 3 and 4. Wings normal, iridescent, the marginal fringes moderately long. Venation pale yellowish. Petiole yellowish.

Antennae 9-jointed. Scape longer than pedicel, nearly as long as pedicel and first funicle joint combined. Pedicel cylindrical oval, not as long as joint 4; 3 much smaller, subequal to, or slightly larger than, 7 and 8; 4 long, cylindric, by far the longest funicle joint, shorter than scape, or slightly shorter than joints 5 and 6 combined. Joints 5 and 6 equal, oval, each much shorter than 4, much longer than 7 or 8; the latter equal or subequal to 3, or smaller. 9, or the club, conspicuously larger, elliptical.

Supposedly bred from the eggs of *Anthonomus quadrigibbus* Say in the fruit of *Crataegus*, sent in by Mr. J. H. Beattie from Fort Valley, Georgia, in connection with the Deciduous Fruit Insect Investigations, Bureau of Entomology, United States Department of Agriculture. The supposition is doubtful, the eggs of other insects evidently being present, as four distinct Mymarids and one species of Trichogrammidae appeared from time to time from the jars containing the infested fruit. These were species of *Gonatocerus*, *Polynema*, and *Ooctonus*, genera of Mymaridæ, and an undescribed Trichogrammid, near *Paracentrobia*. The hosts are therefore but obscurely indicated. Described from two females. June 20, 1905.

Type.—No. 8943, United States National Museum.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDÆ.—LXII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Leptomeris quinquelinearia Packard. This species occurred to me in the Platte Canyon, Colorado in July. Eggs obtained July 10 hatched in six days, the larvæ were matured on August 8 and the imagoes began to emerge on August 23. The weather was very warm. I met with the species again at Kaslo, British Columbia, obtaining eggs on June 17 which hatched in eight days. The larvæ grew very slowly, reaching the fourth stage in August and hibernated without becoming mature. The weather was cold and rainy all the season.

Egg. Laid loose, rolling about. Elliptical, one diameter less but not flattened, micropylar end truncated squarely and rather distinctly, the other end rounded. About 12 straight, parallel, longitudinal ribs, elevated, with a fine waved sharp crest, ending bluntly at the truncation, confused into reticulations at the other end. Cross-striæ fine, mostly parallel, a little raised, forming cells three times as wide as long. Micropylar end coarsely reticulate, a little bulging, the marginal reticulations joining the ribs which round over the edge of the truncation, being without bordering ridge. Uniformly whitish yellow, soon turning deep pink. Size .65 x .5 x .4 mm.

Stage I. Head rounded, free, erect, sordid testaceous. Body elongate, slender, normal, whitish, the dorsum broadly dark brown, diffusely narrowed at the anal end, obsoletely divaricate on joint 2; a similar broad subventral band staining the feet of joint 10; anal feet pale, thoracic feet partly brown. Tubercles and setæ obscure, the setæ short, narrowly club-shaped.

Stage II. Head rounded bilobed, erect, dull whitish spotted on the face, the vertex and sides thickly brown mottled; width .4 mm. Body slender, pale greenish, finely annulate. Dorsal and subventral bands of dark purple brown, the latter segmentarily submaculate in darker; traces of a white edge to the dorsal band and obscure line stigmatally.

Stage III. Head rounded, oblique, clypeus whitish, lobes more yellowish, brown dotted in the vertical suture and in a darker stripe over the center of lobe; width .6 mm. Body slender, finely annulate. Dorsal line dark brown, composed of a fine subdorsal line and a large dorsal one which widens segmentarily to be confluent with the subdorsals; rest dull green, slightly silky shining; a faint subventral brown shade joining brown segmentary spots. Thoracic feet brown, abdominal ones green, the foot of joint 10 brown before.

Stage IV. Head whitish, a straight line of dark mottling over the lobes and a short paler line each side of the vertical suture; width .9 mm. Body moderately slender, straight, the central segments three times as long as wide and finely, numerously annulate. Dorsum brown, undulating, cut by a dorsal line which is dark brown on the segments, yellowish in the incisures; a subdorsal black shaded line; sides and especially the subventral fold pale yellow; venter broadly black, pulverulent, cut by a broken subventral yellowish line. Feet pale, the abdominal ones pale outwardly. Marks all pulvurulent and shaded. General appearance dark brown with yellow line on subventral fold

Stage V. Head rounded, slightly bilobed, clypeus large, held obliquely flat, antennae large, projected; whitish on the clypeus, the vertex about the sutures brown, a nearly black mottled stripe over the center of the lobe, the space between yellowish white; sides white, sparsely brown mottled; width 1.2 mm. Body slender, normal, held straight, finely annulate; yellowish white, a broad diffuse, dorsal band, widened on the segments; narrow lateral, narrow stigmatal and narrow subventral brown-black lines, a broad segmentally widened ventral band sometimes pale or diluted medially. Lines pulverulent, not very definitely edged, more or less confluent. The subventral fold shows distinctly pale yellow. Some larvæ were light brown, others heavily black marked, others partly red-brown, partly black. Tubercles and setae small, obscure, spiracles black; thoracic feet pale, sordid, appressed; abdominal ones approximated, whitish outwardly dark brown within.

Pupation in a slight cocoon at the ground. The larvae were fed on *Polygonum*, their natural food plant not being determined, though I suppose they will feed on various low plants.

ON THE SECONDARY SEXUAL CHARACTERS OF NOTIOPHILUS.

BY ROLAND HAYWARD, MILTON, MASS.

Some years ago I published a short note on the secondary sexual characters of the North American species of Omophron (Psyche, ix, p. 304), in which I referred to the dilatation of the first* joint of the middle tarsi in the males of a large majority of our species of that genus. Until a short time ago I was unaware of the occurrence of this character elsewhere in the Carabinæ, though quite frequently observable in several groups of the sub-family Harpalinæ.

My attention, however, was recently called by Mr. E. A. Schwarz to the fact that C. G. Thomson (Bull. Soc. Ent. France, 1883, p. cxii) had pointed out that in three European species of Notiophilus (*aquaticus* Linn, *palustris* Duft. and *biguttatus* Fab.) the first joint of the middle tarsi is dilated and spongy beneath in the males. I was thus led to an examination of the North American species. Males have been seen of all those known to occur within our faunal limits except *aquaticus* Linn. and *obscurus* Fall. Based upon this character they may be divided into two groups. Of these the first contains *aquaticus* Linn., *sylvaticus* Esch., *hardyi* Putz. and *nitens* Lec., in all of which the basal joint is dilated in the males, and, in the first three at least, spongy beneath. Whether the latter character occurs in *nitens* I have been unable to ascertain, as the only specimen that I have been able to study, i. e.: Leconte's type, is so mounted that only the upper surface of the joint is visible; but in all probability it agrees with the other species. Although not seen by myself, I have included *aquaticus* on Thomson's authority. In the second series the joint is simple as in the females. Here are included *æneus* Hbst., *semiopacus* Esch., *semistriatus* Say and *sibiricus* Mots.

The tarsi are but narrowly dilated in the males of all our species. This applies to the anterior tarsi as well as to the basal joint of the middle pair.

M. Pierre Lesne (Bull. Soc. Ent. France, 1888, p. clxv) calls attention to a character common to many Carabidæ which he has observed in the European species of Notiophilus, i. e.: that the anal segment has one setigerous puncture each side at tip in the males, two in the females. This applies to all the species of our fauna that I have seen. Of *nitens* the male alone is known to me, in which the anal segment is unisetose each side. *Aquaticus* and *obscurus* are both unknown to me in nature.

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*Erroneously printed "second," but corrected ibid, p. 335.

A LIST OF THE SPECIES OF CATOCALA TAKEN AT GROTON AND WINCHENDON, MASSACHUSETTS.

BY WILLIAM N. SOUTHER, GROTON, MASS.

The following list of species of the genus *Catocala*, have been taken in the vicinity of Groton and Winchendon, Mass. Those marked with an asterisk have been collected in both places, while *Catocala minuta* and *C. briseis* have only been found at Winchendon.

Catocala **nubilis* Hbn., June 10, quite common.
**amica* Hbn., July 22, not common.
amica Hbn., var. *nerissa* Hy. Edw., July 24, not common.
**gracilis* Edw., July 25, not common.
minuta Edw., August 1, rare.
**grynea* Cram., August 3, common.
crataegi Saund., var. *blandula* Hulst, July 25, quite common.
**ultronia*, Hbn., July 20, common.
coccinata Grt., July 24, not common.
**cerogama*, Gn., August 19, not common.
**ilia* Cram., July 15, common.
**ilia* Cram., var. *uxor* Gn., July 15, common.
ilia Cram., var. *zoe* Behr. July 20, rare.
**parta*, Gn., July 20, quite common.
**unijuga* Wlk., August 14, quite common.
briseis Edw., August 1, not common.
**cara* Gn., August 26, common.
**concumbens* Wlk., August 20, common.
**amatrix* Hbn., August 25, not common.
**antinympha* Hbn., August 2, common.
badia G. and R., July 24, rare.
**habilis* Grt., August 25, common.
**paleogama* Gn., August 14, common.
paleogama Gn. var. *phalanga* Grt., July 20, rare.
**neogama* S. and A., August 20, rare.
**piatrix* Grt., September 1, quite common.
**relicta* Wlk., August 25, not common.
**relicta* Wlk., var. *phrynia* Hy. Edw., August 8, rare.
**relicta* Wlk., var. *bianca* Hy. Edw., August 28, rare.

epione Dru., July 26, common.
robinsonii Grt., August 18, rare.
retecta, Grt., August 20, common.
vidua, S. and A., August 25, common.
obscura Strck., July 7, August 18, rare.
**tristis* Edw., August 8, rare.

SOME NEW EUCERINE BEES FROM THE WEST.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

Melissodes herricki, n. sp.

♂ Length about 13½ mm., robust, black, densely covered above with short fulvous pubescence, very bright orange-fulvous on thorax; on abdomen thinner, showing the black shining surface through, but the hind margins of segments 2 to 6 broadly testaceous, and covered by fulvous hair-bands; face, cheeks, pleura and ventral surface generally with white hair; legs also with white hair, but the knee-tufts ochreous, hair on outer side of tibiae slightly yellowish, and that of inner side of tarsi pale orange; small joints of tarsi ferruginous; spurs ferruginous. Eyes large, greyish-brown; facial quadrangle much longer than broad; clypeus light lemon yellow, the anterior edge ferruginous; labrum cream-color, densely covered with white hair; mandibles entirely black; antennae of only moderate length (about 7mm), black; flagellum brown-black beneath, with obscure lighter dots on the joints; tegulae ochraceous; wings dusky hyaline, nervures dark fuscous; second submarginal cell broader than high, but by no means so long as first; second transverso-cubital nervure with a curious double curve; first r. n. joining second s. m. not far from its end; third s m. abruptly angled outwardly; apical plate of abdomen with the margins gently concave, not notched.

♀ Looks like the ♂, but abdomen rather broader, and appearing entirely fulvous, the pubescence being thick and the tegument yellowish; hair of apex very bright orange-fulvous; hair of legs more decidedly fulvous-tinged, that on outer side of middle tibiae shining light fulvous, that on inner side of basal joint of hind tarsi ferruginous; scopa of hind legs fulvous-tinted, long and beautifully plumose; facial quadrangle about square; clypeus and labrum black, the hair of the latter tinged with yellowish; apical half of mandibles mainly fulvous, antennae dark, third joint longer than 4 + 5, flagellum slightly brownish beneath. The double curve of the second t. c. is as in the ♂.

Hab.—New Mexico (*F. H. Snow*); no locality given, but the specimens are numbered 91 (♂) and 92 (♀). Named after the late Dr. C. L. Herrick, in recognition of his important work on the geology and zoology of New Mexico, carried on with indefatigable zeal for many years in spite of poor health and other difficulties. Superficially, this fine insect looks just like *M. townsendi* Ckll., but it is easily distinguished by the color of the antennae and of the hair of the scutellum. In the form and color of the abdomen the female *M. herricki* is like male *M. townsendi.*

Melissodes epicharina, n. sp.

♀ Length nearly 12 mm., rather stout, with a long-oval, convex abdomen; black head and thorax with abundant white pubescence, becoming mouse-color dorsally, with much black on vertex; mesothorax except in front, and scutellum; eyes dark grey-brown; facial quadrangle broader than long; clypeus strongly and extremely and densely punctured; labrum covered with white hair; mandibles entirely black; flagellum bright ferruginous beneath beyond second joint; mesothorax moderately shining, with distinct, not very close punctures; scutellum more closely punctured; tegulae piceous, with light hair, and a few black hairs intermixed; wings strongly dusky, with a reddish tint; nervures piceous; second s. m. broad but oblique, not narrowed above, receiving the first r. n. not far from its end; third s. m. narrowed rather more than half to marginal; legs black, small joints of middle tarsi, and hind tarsi, becoming ferruginous; hair of legs pale, ferruginous on inner side of tarsi, scopa of hind legs yellowish and strongly plumose; abdomen with light hair at base and sides, and long recumbent yellowish hairs on third and fourth segments, not abundant enough to alter the general dull black effect; on second segment is an even, rather broad, entire subapical band of cream-colored tomentum; two apical segments with black hair, tufts of white showing laterally; ventral segments fringed with pale hair, hair on last segment fuscous. The middle trochanters, and the adjacent base of their femora, have each a curious patch of ferruginous pubescence. Third joint of maxillary palpi long; fourth well-developed and cylindrical.

Hab.—Oak Creek Canyon, Arizona, 6000 ft., July (*F. H. Snow*). Very distinct by the one-banded abdomen, which gives it a curious superficial resemblance to *Epicharis maculata* Smith. A variety (Snow 443) has two bands, the additional one at the base of the second segment; in this example the eyes are sea-green. This may be called var. a.

Melissodes tenuitarsis, n. sp.

♂ Length about 9 mm.; black, shining, head and thorax with rather abundant, long, dull white hair, nowhere mixed with black, the disc of thorax nude; eyes light grey; facial quadrangle nearly square, but broader above than below; front bare, very black and shining; clypeus bright lemon-yellow, its anterior edge black; labrum black; mandibles black, the apical half reddened; antennae nearly 9 mm. long, entirely dark, the flagellum obscurely reddish beneath, without pale dots, the joints with more or less distinct longitudinal keels; mesothorax very shiny, with close well-defined punctures; at the posterior middle the punctures are sparse; scutellum similarly shiny and punctured, and with a little median longitudinal keel on its anterior half; tegulae piceous, with reddish margins; wings clear, almost milky, suffused with ferruginous towards the base; nervures ferruginous, second s. m. oblique, rather broader than high, receiving the first r. n. about the beginning of its last third; legs black, with scanty pale hair, claw-joints ferruginous; spurs yellowish-white; middle and hind tarsi very long and slender; basal joint of hind tarsi flattened but very narrow, not hairy; abdomen black, the hind margins of the segments very broadly whitish-hyaline; first segment with long dull white hair; the other segments with scanty pale hair, not forming definite bands, but apparently largely denuded; apical plate broad, deeply notched on each side; the usual four lateral spines; venter normal.

Hab. —Arizona (precise locality not given), Aug. 1902 (*F. H. Snow*, 1797). Very easily known from *M. confusa* Cr. and *M. microsticta* Ckll., by the slender tarsi.

Melissodes hexacantha, n. sp.

♂ Length about 11 mm.; black, rather robust; antennae comparatively short, hardly 7 mm. long; flagellum bright ferruginous beneath, except at base, but the apical margins of the joints narrowly darkened; third antennal joint more than twice as long as second; head and thorax with abundant light hair, whitish on face and beneath, pale ochreous dorsally, that on disc of scutellum and posterior disc of mesothorax black, but a band of ochreous between the black of mesothorax and scutellum; vertex with a very few black hairs at the sides; eyes pale greyish-green; facial quadrangle about square; clypeus strongly and extremely densely punctured, *black, with a yellow transverse band adjacent to the anterior margin*; labrum black; mandibles black, with a fulvous apical stripe; mesothorax shining, with strong rather close punctures; scutellum also strongly punctured; tegulae shining black, with light ochreous hair; wings slightly dusky, with a yellowish tint; nervures piceous; second s. m. very large, not narrowed above, but oblique, receiving the first r. n. not far from its end; third s. m. narrowed more than half to marginal; legs black, with yellowish-white hair; small joints of tarsi becoming ferruginous; spurs pale reddish; hair on inner side of tarsi pale dull orange; abdomen rather broad, with yellowish-white pubescence, forming subapical band on segments 2 to 4, but no defined basal one on 2; hind margins of segments broadly brownish-hyaline; pubescence of fifth and sixth segments chocolate-color; apical plate squarely notched at sides; last three segments spined laterally, the first pair of spines small, the second very large, the third slender.

Hab.—Arizona (precise locality not stated), Aug. 1902 (*F. H. Snow*, 447).

The antennae are very much shorter than in *M. tristis* Ckll. On account of the clypeal marking, this might be confused with *Xenoglossa pruinosa* and *X. angelica*, but it is very easily known from these by the black tegulae and black hair on scutellum

Three other specimens are numbered (Snow coll.) 2026 (Oak Creek Canyon, Ariz., 6000 ft. August), 2027 (also Oak Creek Canyon) and 1053 (Arizona); the last is much worn. These show that the species varies as follows:—

Var. a. Thorax above without black hair, except a very few (probably not half a dozen) on posterior middle of mesothorax, the dark hair remaining at sides of vertex, however. Hair of fifth and sixth abdominal segments black. No. 2026.

Var. b. Black hair very distinct on scutellum; lower half of clypeus yellow, with a pointed process of yellow directed upwards in the middle line. No. 2027.

Var. c. Yellow of clypeus reduced to a small stripe, about one-third as long as width of clypeus. No. 1053.

Melissodes nigrosignata, n. sp.

♀ Length about 12 to 13 mm ; breadth of abdomen about 5 mm., or slightly over, a rather large robust species, having about about the size, build, and pattern of abdominal banding of *M. martini* Ckll., but the abdominal bands are creamy-tinted, and considerably broader; the pattern referred to consists of broad entire bands on segments 3 and 4, and 2 with an entire basal band, and a broadly interrupted median one, the lateral segments of the later pointed mesad, but not or hardly oblique. The basin of the first segment is covered with white tomentum (no dark intermixed), and the fifth and sixth segments are covered with black hair, long white hair showing at the extreme sides of the fifth; the hair of the venter is black, except quite at the sides, where it is white. Eyes reddish or grey; facial quadrangle a little broader than long: clypeus strongly and extremely densely punctured; mandibles with a brilliant orange apical stripe; antennae dark, flagellum faintly reddish beneath; hair of face, cheeks and pleura white, of head and thorax above pale ochreous; vertex with some black hairs, especially behind ocelli; hind part of mesothorax with a large patch of black hair, disc of scutellum also covered with black; tegulae black, with pale ochraceous hair; wings smoky, nervures black; second s. m. very large and broad, oblique, receiving the first r. n. near the beginning of its last third; third t. c. bent, not angled; legs black; hair of femora dull white; of anterior and middle tibiae dull white, with nearly half the outer side (divided obliquely) black, and the short hair on the inner side of anterior tibiae black; hair of anterior and middle tarsi black; of hind tibiae long (plumose on outer side) and stained with pale fulvous, some of the apical hairs on inner side tipped with black; basal joint of hind tarsi with long pale fulvous-tinged hair covering basal half outside, otherwise the hair is black, long, coarse and abundant on inner side. Third joint of maxillary palpi long.

Hab.—Oak Creek Canyon, Arizona, 6000 ft., Aug., 2 ♀. (*Snow*, 1988 and 1993.) Easily known for *M. martini* Ckll., by the color of the hair on the legs, the white hair showing at sides of fifth abdominal segments, and the narrower face. The black hair on thorax above, and other characters, separate it from *M. blakei*, Ckll. It really has a good deal of affinity with *M. glenwoodensis* Ckll., but is more robust, and is distinguished by the ochreous and black hair of thorax above, the hair on inner side of hind tibiae not black, their spurs longer, the hind one gently curved. It is conveniently distinguished from *M. mysops* Ckll., by the light hair of the pleura, and the bicolored middle tibiae.

Melissodes semitristis, n. sp.

♂ This is exactly what a hybrid between *M. tristis* and *M. menuacha* might be imagined to be like. It has precisely the stature, pubescence, etc. of *M. menuacha*, but the clypeus is wholly black (densely covered with white hair), the face is considerably broader, and the eyes are reddish-grey. The mandibles and labrum are black; there is no black hair on the disk of the thorax. From *M. tristis* it differs in having the stature of *menuacha*, and the nervures piceous or very dark brown; the width of the face agrees with *tristis*. Tegulae black, as in *tristis*. The insect is to *tristis* much as *menuacha* is to *agilis*.

Hab.—Oak Creek Canyon, Arizona, 6000 ft., July. (*F. H. Snow*, 2009.)

Melissodes prælauta, n. sp.

♂. This looks just like *M. semitristis*, and was placed with it until the very different head was observed. The eyes are black and very prominent, and the face is narrowed below, so that the length of the facial quadrangle is considerably greater than its breadth at the lowest point; the face is very densely covered with long pure white hair, and the clypeus is of a curious greyish-white color; the mandibles are entirely black, except a small yellowish apical stripe; the labrum is black, with a large yellowish-white spot. The maxillary palpi are normal for *Melissodes*, with the last joint minute. The antennae are about 7mm. long, or rather more, with a rather stout flagellum, which is dark chestnut-red beneath. Tegulae black; nervures rufo-fuscous, wings perfectly hyaline, rather milky; *second s. m. extremely large, larger than first*, broader than high, receiving the first r. n. near the beginning of its last third; no black hair on head or thorax; the abundant hair of head, pleura and mesothorax entirely snow-white; that of metathorax, scutellum and abdomen more or less strongly stained with yellowish, that of the apical part of the abdomen quite ochreous; ocelli ruby-color; mesothorax shining and punctured; hind margins of abdominal segments broadly yellowish-hyaline, the hair-bands apical and only moderately conspicuous, the region between the bands being more or less hairy; *the last three segments with prominent lateral teeth*; legs black with white hair, only the claw-joints rufous; hair on inner side of basal joints of middle and hind tarsi clear ferruginous. The abdomen is not quite so broad as that of *M. semitristis*.

Hab. Oak Creek Canyon, Arizona, 6000 ft. (*F. H. Snow*, 2010). The peculiar appearance of the clypeus suggests that it may have failed to attain its natural color, but assuming this part to be naturally yellow; it is still impossible to identify the species with anything previously described. Seen from behind, the insect could very well be taken for *M. menuacha*, but in front the much darker antennae, narrower face, dark eyes and white pubescence are distinctive enough. *M. Snowi* Cr., which has the white pubescence in front, has it also behind, besides being much smaller.

Melissodes duplocincta, n. sp.

A species with a narrow abdomen and bluish-white pubescence, having a remarkable superficial resemblance to *Synhalonia lippiae* (Ckll.), but the subapical band on second abdominal segment, which in *lippiae* is reduced to a line on each side, is in *duplocincta* entire and even, so that the anterior part of the abdomen is girt by by two parallel clean-cut white bands, separated by a black interval about as wide as either of them. The third and fourth segments in the female, and the third to fifth in the male, have broad even white bands. The pubescence of the head, thorax and legs is white, but the disc of the scutellum is covered with short black hair, and some greyish-brown hair is mixed with the white on the mesothorax, producing in the ♀ a curious streaked or mottled appearance, as though the hair were stained; the hair of the vertex is entirely white in the ♂, but there are dusky hairs just behind the ocelli in the ♀.

♂ Length about 10 mm.; antennae long, about 7½ mm.; scape stout; flagellum slender, clear ferruginous beneath, except the apical two or three joints, which have not the form of *Synhalonia*; clypeus lemon-yellow, with a large squarish black mark at each side above; labrum pale yellow; base of mandibles entirely yellow; tegulae light fulvous; wings clear, stigma ferruginous, nervures fuscous; second s. m. almost exactly square, receiving the first r. n. almost at its end; third s. m. narrowed not quite half to marginal, its outer side curved, not angled; legs black, tarsi rather dark ferruginous; a raised, curved, transverse lamina on each side of venter near apex; spines at sides of sixth segment black, and unusually long; first segment of abdomen with much white hair, but the broad apical margin bare except at the extreme sides; other segments as described above; sixth covered with black hair, with a few light hairs at sides.

♀ Similar to the male, eyes pale greenish-grey; no yellow on clypeus, etc., the clypeus shining, with small punctures and little ridges, a sort of strawberry surface; middle of mandibles reddened; flagellum red beneath except basal joint; base of third abdominal segment broadly dark dull reddish, the two apical segments with black hair, a good deal of white at extreme sides of fifth; venter reddened basally; scopa on hind legs glistening white.

Hab.—Bill Williams' Fork, Arizona, August (*F. H. Snow*), one of each sex. *M. duplocincta* runs in my tables (♀) to the vicinity of *M. pecosella*, to which it is allied, but from which it is easily known by the narrower, bluish white (not creamy) abdominal bands, and the light reddish tegulae. The width of the face is about the same. From *M. intermediella* it is separated by the shape of the abdomen, the whiter and more even abdominal bands; the square (not oblique) second s. m., with the first r. n. joining nearer the end; and the light reddish, tegulae (they are very dark in *intermediella*). The clypeus also is very shiny, whereas in *intermediella* it is very densely punctured and dullish. The male *duplocincta* runs to the vicinity of *M. paroselæ*, Ckll.; but the latter is smaller, with the hair of the thorax in front light fulvous, the tarsi clearer red, etc.

Xenoglossa strenua, Cr., var. *Kansensis*, n. var.

♂ Rather larger; legs dark reddish-fuscous, the anterior legs at most ferruginous but then dull-colored, very different from the typical bright red; tomentum of apical abdominal segments pale cinereous or whitish, not at all ochreous or fulvous.

Hab.—Clark Co., Kansas, 1962 ft., June (*F. H. Snow*, 1186); Morton Co., Kansas, 3200 ft., June 1902 (*F. H. Snow*, 439); Wallace Co., Kansas, 3000 ft. (*F. H. Snow*, 1791.)

THE TUSSOCK MOTH IN ROCHESTER, N. Y.

Because of the destruction which has been wrought on shade trees by the tussock moth, the Board of Park Commissioners has declared war against the pest and the school children of the city are now enlisting in a war of extermination on the cocoons. The crusade is being conducted on the lines followed in the famous hunt of eleven years ago, when Rochester was so thoroughly cleaned of cocoons that not until the present year have the ravages of the past become serious again. The school children will be paid seven cents a quart for the cocoons, each quart to contain about 400 egg masses and weigh 2½ ounces. Five hundred dollars has been appropriated by the park board for the purpose. In addition to the regular payments, there will be six special prizes of $5 each to the six boys making the highest records. It is an interesting calculation to figure how many caterpillars will be destroyed by this plan if the fund be exhausted. At seven cents a quart $470 will buy 6714 quarts of egg masses. Each quart must contain at least 375 egg masses, or a total of 2,517,750 egg masses in the 6714 quarts. Professor Slingerland of Cornell University estimated that each egg mass would produce 200 caterpillars, so that 2,517,740 egg masses would produce 503,550,000 caterpillars next spring. Approximately, therefore, 500,000,000 caterpillars will be destroyed by the expenditure of the $500, which is at the rate of $1 a million, or 10,000 caterpillars for a cent. In the cocoon hunt of eleven years ago the first prize was won by a boy who was credited with collecting more than 2,000,000 cocoons, and his nearest competitor had more than 1,500,000 to his credit. It was estimated that the pupils of one school alone had destroyed 7,500,000,000 caterpillars. No one else had figured out how many caterpillars were killed by the work of all the schools, but it was sufficient to keep the city clear of the pest for more than a decade. In view of these facts members of the park board do not agree with the State entomologist at Albany, who in a recent bulletin belittles the value of such a crusade. (*Boston Evening Transcript.*)

RECENT ENTOMOLOGICAL LITERATURE.

MAY FLIES AND MIDGES OF NEW YORK. BULLETIN 86, NEW YORK STATE MUSEUM.

This interesting and important work, which constitutes the third report on the aquatic insects of New York State, contains 352 pages and 37 plates. Professor James G. Needham gives an interesting account on the summer food of the bullfrog, followed by systematic notes on the Hemerobiidae and the Ephemeridae, with keys to the genera and descriptions of six new species and one new genus *Drunella.* The family Hydroptilidae is treated by Mr. Kenneth J. Morton; one new genus (*Neotrichia*) and twelve new species being described.

The greater portion of the report is by Mr O. A. Johannsen on the Nematocerous Diptera comprising the family Chironomidae. This is the first American publication of a monographic character bearing on this large and important family, and the degree of thoroughness with which the author has accomplished this work calls for great praise. The Chironomid genera of the world are defined, and all the North American species tabulated and described, together with many of the larvae and pupae, except the group *Ceratopogon* which is only generically treated.

Some idea of the amount of work involved can be gained from the following figures: upwards of 50 genera and over 200 species are described, including two new genera (*Anatopynia* and *Ablabesmyia*) and 58 new species, or species that are not recorded in Aldrich's Catalogue. The genus *Tanypus* of authors is divided into three genera, *Procladius*, *Ablabesmyia* and *Tanypus.* The group *Ceratopogon* now comprises the genera *Ceratopogon*, *Culicoides*, *Oecacta*, *Bezzia*, *Ceratolophus* and *Palpomyia*, the latter being divided into a number of subgenera including *Heteromyia* Say.

C. W. J.

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Asterisks indicate descriptions of new species of American insects or of new genera.

PERIODICALS CITED.

4	The Canadian Entomologist, London, Ont.
6	Journal of the New York Entomological Society.
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See also Cook, under The General Subject.

In accordance with the vote of the Club, PSYCHE will henceforth give as much space as possible to papers presenting the results of experimental work in entomology. With a view to making the journal more efficient in this direction, three new associate members have been elected: Professor Charles B. Davenport of the Carnegie Institution, Professor Vernon L. Kellogg of Leland Stanford Junior University, and Professor James G. Needham of Lake Forest University. All these have accepted, and their names appear in the list this month.

MEETINGS OF THE CLUB.

A regular meeting of the Club is held on the third Tuesday of each month (except July and August) in the room of the Appalachian Mountain Club, 1050 Tremont Building, Boston. Meetings begin at 7.45 P. M. Entomologists visiting Boston are cordially invited to be present.

ANTS FROM THE SUMMIT OF MOUNT WASHINGTON.

BY WILLIAM MORTON WHEELER, NEW YORK, N. Y.

During the past year Mrs. Annie Trumbull Slosson spent several months on the summit of Mount Washington, N. H., collecting and studying the insects. She has kindly sent me all the species of ants she succeeded in taking. Though the collection is a small one, as this group of insects was very poorly represented on the summit, it is nevertheless of more than usual interest. It comprises the following forms:

1. *Camponotus herculeanus ligniperdus* Latreille var. *pictus* Forel. A single deälated female. My collection contains two very similar specimens taken during August 1901 in the same locality by Dr. C. S. Bacon.

2. *Formica sanguinea aserva* Forel. Two deälated females. I have recently found two colonies of this form in the Litchfield Hills, Conn., at an altitude of about 1000 ft. The females are rather small (7-8 mm.) compared with those of our more abundant *F. sanguinea rubicunda*. The gaster and head are black, the thorax and petiole dull yellowish brown, the former mottled with black, the legs and antennae dark brown. The rich red color of our common forms of *sanguinea* is completely lacking. The clypeal notch is broad and deep.

3. *Lasius niger* L. var. *americanus* Emery. A single winged female of very small size (5.3 mm.) but in other respects like the common form.

4. *Lasius umbratus mixtus* Nylander var. Three males and two winged females resembling the corresponding sexes of var. *aphidicola* Walsh, except that the females collected by Mrs. Slosson are decidedly darker.

5. *Dolichoderus taschenbergi* Mayr var. *gagates* Wheeler. A single deälated specimen of the hitherto unknown female of this species and variety. It measures 4 mm. and resembles the worker in the structure of the epinotum. The head and thorax are very smooth and shining, the epinotum somewhat more opaque, with scattered shallow foveolæ. The body and appendages are deep black, the tips of the mandibles and articulations of the legs slightly brownish.

6. *Leptothorax acervorum canadensis* Provancher. Three deälated females all darker than the females of the typical form in my collection.

7. *Myrmica rubra brevinodis* Emery var. A single winged female differing

from the typical form in being of smaller size and much darker color and in having the antennal scape somewhat straighter at the base.

8. *Myrmica rubra scabrinodis* Nylander var. A single deälated female belonging to a form of this subspecies with a small calyculate dilatation at the base of the antennal scape, long straight epinotal spines and strong sculpturing on the head, thorax and pedicel.

9. *Myrmica rubra scabrinodis* Nylander var. *schencki* Emery. A single winged female taken by Dr. C. S. Bacon during August 1901 on the summit. This insect is darker in color than females from Colebrook, Conn., in my collection.

This little collection of ants is remarkable because it comprises males and females but no workers. This fact taken in connection with Mrs. Slosson's statement to me that she was quite unable to find any colonies of ants on the summit, but at most chance aggregates of two or three females, indicates that this portion of the mountain, which is above timber-line, must be peopled anew every year by female ants that never succeed in establishing colonies. These females (and the shorter-lived males, when these are found, as in the case of *Lasius nixtus* above recorded) undoubtedly drift to the summit while on their nuptial flight. This is shown by the relatively large number of winged females in the above list. They are in all probability individuals that have ascended to an unusual altitude and have been swept onto the mountain summit by an upper air current. This seems to be the only way of accounting for the peculiar occurrence of forms like *Dolichoderus gagates* in such a locality. This ant is not known to breed further north than the low pine-barrens of New Jersey, where it nests in the warm, white sand about clumps of grass and attends plant-lice on the pines and scrub oaks.* The occurrence of this insect on a mountain summit 6293 ft. high and some hundreds of miles further north must be regarded as accidental. Only in case the *Dolichoderus* females succeeded in establishing their colonies on the summit of Mt. Washington would this condition be truly analogous to that of certain plants like the eastern prickly pear (*Opuntia opuntia*) which grows in low sandy spots in Florida and on the rocky ledges of certain hilltops in New Jersey, New York and Massachusetts. A strictly parallel instance, however, seems to be presented by *Tapinoma pruinosum* Roger, an ant which I have taken in the sandy pine-barrens of New Jersey and on the summits of some of the Ramapo Mountains in southern New York, but not in intermediate stations.

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*Conf. my paper: The North American ants of the Genus Dolichoderus, Bull. Am. Mus. Nat. Hist. Vol. XXI, 1905. pp. 305—319.

In the study of mountain faunas it is well to bear in mind what Forel says in his work on the ants of Switzerland*: "One should never judge of the habitat of a species from the elevations at which isolated males or females have been captured. We have, in fact, observed that these sexes always seek the summits for the purpose of mating. On a beautiful day in summer, they often alight in regions where their species cannot subsist, and where they soon perish. Thus M. Bugnion found males of *Formica rufa* and *pratensis* on the Hüfi Glacier and he brought me specimens of these ants from the summit of the Stätzerhorn (Grisons). I have myself taken males and females of these ants on the snow-covered ridge which separates the Engadine from the valley of Roseg between the Piz Surlei and the Piz Corwatsch. Now neither the formicaries of *rufa* nor the formicaries of *pratensis* are found above the region of pines, whereas the winged individuals just mentioned had ascended to that of the eternal snows. Hence a female *Myrmecina Latreillei* which I took at a considerable elevation in the Jura near Mont Tendre does not prove to me that the formicaries of this species subsist at such an altitude."

The absence of ant colonies on the summit of Mount Washington is to be attributed to the length and rigor of the winter at such an elevation. In the Rocky Mountains colonies are very abundant up to an altitude of 9000 to 10,000 ft. and may be found even as high as timber-line between 11,000 and 12,000 ft. I have observed this distribution on Pike's Peak, near Cripple Creek, and on the neighboring mountains. Very similar conditions seem to prevail in the Himalayas.

Bare, cold mountain tops thus appear to be a source of "catastrophic elimination" to those winged seeds of their species, the female ants. Other sources of such elimination are torrential showers occurring during or just after the marriage flight; many birds, which are fond of eating winged ants; and drowning, as the result of long flights out to sea or over our Great Lakes. During the summer months the insect drift which is cast up on the beaches of Lake Michigan and Lake Superior sometimes contains thousands of dead female ants. Other less important agents of destruction are some of the solitary wasps that provision their nests with female ants captured during or just after the marriage flight. *Aphilanthops frigidus*, for example, has been seen to capture and carry home our common *Formica fusca* var. *subsericea*. Mr. H. L. Viereck has sent me specimens of these wasps collected together with their prey by Mr. Morgan Hebard in Baraga County, Michigan. When we add to these destructive agencies the attacks of lethal fungi and subterranean insects on the females after they have shut themselves off from the world in their earthern cells for the purpose of ovipositing and rearing their brood, we are able to understand why so very few of the myriads of female ants that annually take their nuptial flight, ever survive to become the mothers of flourishing colonies.

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*Les Fourmis de la Suisse, Zürich 1874, p. 211.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE—LXIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Sciagraphia neptata Guenée.

Egg. Elliptical, very strongly flattened, concave, slightly wedge-shaped in side view, the ends rounded; evenly reticulate in broad, rounded ridges, wavy, stellate hexagonal, rather smaller on the flat sides. Dark bluish green, turning, red around the margin. Size .8 x .5 x .3 mm.

Stage I. Head rounded, brownish luteous, sutures darker. Body moderate, rather short, luteous, dark olive green shaded broadly over the dorsum except on joints 2 and 13 posteriorly: venter faintly dark shaded. No shields; tubercles and setae obscure, tubercles slightly elevated, but concolorous, setae stout, pale, quite small, enlarged at tip.

Stage II. Head luteous, slightly bilobed; width .5 mm. Body moderate grayish green with broad ventral purple brown stripe and faint, narrow, pale lines, two showing in the subdorsal region. Feet dark within: tubercles and setae obsolete.

Stage III. Head round, full, flattish before, greenish white with a straight brown mottling on the sides; width .9 mm. Body moderate, green, the dorsum with five parallel olivaceous blackish bands as wide as the interspaces; venter broadly smoky blackish. No shields; thoracic feet shaded darker; abdominal ones pale without; tubercles minute, setae fine, dark.

Stage IV. Head bilobed, oblique, pale greenish luteous with whitish shades, a brown flush on the sides, the angle below the eyes and antennae whitish; width 1.5 mm. Body uniform, rather flattened, anal feet large; obscure whitish, not strongly green, a broad subdorsal geminate band more whitish; stigmatal fold pale yellow; a ventral vinous brown shade staining the bases of the feet. Tubercles obsolete, setae fine, dark, obscure. A subventral dark spot on joint 6.

Stage V. Head bilobed, thicker at apex, pale brown shaded, a curved dark brown band across above clypeus and a yellow one on the side behind the eyes; width 2.2 mm. Body moderate, uniform, a somewhat raised black patch subventrally on joint 6. All yellow brown shaded; dorsal, subdorsal, lateral, subventral geminate blackish lines, broken, powdery, the dorsal appearing as intersegmental spots, the others broken intersegmentally, giving an effect of obscure segmentary transverse bands on central part of body. Dark blotches at the bases of the thoracic feet, especially on joint 4; tubercles small, dark, setae dusky, rather long, fine; feet pale; spiracles black edged.

The larvae fed on the balsam poplar (*Populus baslamea*); eggs from Kaslo, British Columbia July 27, mature larva in September. The species is double brooded with hibernation in the pupal stage.

THE BEDBUG, *CLINOCORIS LECTULARIUS*[a] (LINNAEUS), AND THE FOWL BUG, *CLINOCORIS COLUMBARIUS* (JENYNS): HOST RELATIONS.

Adults and larvae attack dead and living mice (*Mus*); *columbarius* feeds on human blood.

BY ALEC. ARSÈNE GIRAULT AND JOHN FRANK STRAUSS, WASHINGTON, D. C.

I. *Clinocoris lectularius* (Linnaeus).

In experimental medicine, the host relations of our common bedbug are of importance from the fact that if they attack animals other than man, their scope in the potential transmission of diseases becomes greatly enlarged. In reviewing the entire entomological and medical literature, as far as it concerns the bedbug, the writers have been unable to come to any definite conclusion concerning these host relations. As far as the entomological literature is concerned, no conclusions at all are possible, for the simple reason that authorities differ, and that no definite experiments have been cited to show that the host of the bedbug is other than man himself. In fact, most of the statements to the contrary are purely conjectural or theoretical.

In the literature of experimental medicine, however, it has been quite frequently stated that bedbugs attack mice, living and dead, and these mice were so used in the experiments performed. But the statements of these facts have been so general, and in a way, so unscientific, that the writers could not, in strict justice, come to any other conclusion than that it was very probable that *lectularius* attacked animals other than man. Nuttall (1897, 1898), in his most important experiments on the transmission of diseases by the bedbug, however, nearly convinces us that both living and dead mice are readily attacked by *lectularius*, but doubt could not be eliminated, because of the use of the general term *wanzen* instead of a specific name, and on account of the presence of a single ambiguous sentence (Nuttall, 1898, p. 626, footnote).

Correspondence with some of the leading hemipterists and personal communications from economic entomologists, all tend to throw doubt on the statements thus made in the medical literature. Scepticism coming from such sources cannot be better evidence, and practically shows that the question remains as yet unsettled.

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[a] *Clinocoris* is masculine, not feminine, as would be inferred from its ending. (Kirkaldy.)

In view of the foregoing facts, and because of the importance of the question, the following preliminary and rather crude experiments have been performed, showing that *lectularius* will readily attack both living and dead mice. The experiments also explain to a certain extent, the supposed occurrence of the bedbug in long unoccupied houses, from the fact that writers, now, will not have to theorize in regard to moisture, and so forth as a food, in order to support their statements.

The specimens used in these experiments were all obtained by jarring beds in one of the large mission houses in the city of Washington, about 7 P. M., September the eleventh, 1905. They were then full-fed, and the majority of them in the last larval instar (instar V). They soon molted, and then, were specifically determined by comparison with specimens in the collection of the United States National Museum.

A. *Experiment with a recently dead mouse.*

A single mouse killed in the insectary of the Department of Agriculture at 8.40 A. M., September 20th, was immediately placed under a large bell-jar, on a clean sheet of white paper.

1. *Nymph.* Six minutes afterwards, 8.46 A. M., a nymph in instar III, which was starved when captured on September 11th, was placed under the bell-jar. It was nearly transparent. The larva paused a few seconds, and then went to the carcass; at 8:46:35 A. M., it was feeding from the toes of the left hind leg, from which it was apparently unable to extract much blood. At 8.51 a. m., it left the toes and crawled completely around the head end of the body to the right hind leg, and there again attempted to feed from the toes of that leg, but with little or no success. At 8:53:30 A. M., it left its last position, crawled around the head end of the body, and attached itself to the abdomen. Up to this moment, the larva was but slightly tinged with blood. Attached to abdomen at 8:54 A. M.; larva's abdomen red from blood at 8:54:30 A. M.; larva half full of blood at 8:57 A. M. The larva appeared to be weak, and was having much trouble to obtain blood. After 9 A. M., the larva remained the same, as far as the amount of food obtained is concerned, but frequently changed its position on the carcass. It was removed from the carcass at 10:30 A. M., having voluntarily left it at 10:20. The body of the mouse was getting cold at 9:08 A. M. The larva was not fully gorged with blood, but it is evident that this was due to its weakness, a condition apparently due to its age, combined with its previously starved condition. Cases of this kind are often met with in this species. It molted on September 28th, without having been fed again.

2. *Adult.* An adult, not recently fed when captured on September 11th, was placed under the bell-jar at 9:26 A. M. The body of the mouse was then cold, and a little stiff.

The adult wandered about, and then at 9:27:30, crawled under the carcass; body then flat and fully colored. Hiding from light. In a few minutes, crawls from beneath the carcass to the side of the bell-jar, not having fed. Jar covered with a black cloth

At 9:44 A. M., jar uncovered and the adult found fully gorged with the blood from the carcass. It was found at rest on the back of the mouse, but began to wander on exposure to the light. Body of mouse now stiff and cold. Adult removed.

Another hungry adult placed under the bell-jar at 11 A. M., the mouse then being dead 2 hours and 20 minutes. It was pale, having just recently passed the fifth ecdysis. At once hid under the carcass.

It did not feed up to 3 P. M., and was then removed. The blood in the carcass had by that time coagulated. Experiments discontinued on account of the lack of material.

B. *Experiment with a living mouse.*

A mouse trapped in the insectary of the Department of Agiculture during the night of September 21–22, 1905, was confined under a bell-jar as in the first experiment at 9 A. M., September 22nd.

At 9:40 A. M., three adults, captured when full-fed in instar V, on September 11th, and since molting on September the 18th, and a single larva in instar IV, hungry when captured, were placed under the jar and the latter covered with a black cloth to exclude the light. None of the insects had fed up to 6 P. M.

At 7 A. M., September the 23rd, the day following, the cloth was removed from the jar, and all of the insects found fully gorged with blood, the abdomens of the adults immensely swollen. Upon exposure to the light they as usual wandered quickly about. The experiment was not repeated because of the lack of enough suitable material,—hungry bedbugs.

C. *Experiment with recently born mice.*

At 6.30 P. M., September 28th, three recently born mice were placed in a group on a clean sheet of white paper and covered with a small bell-jar. Although much alive, their bodies were cold.

Immediately afterwards, three adults of *lectularius*, full-fed nymphs in instar V when obtained on September 11th, molting on September 19th, and now, therefore, hungry adults, were introduced. Left over night in a dark room.

At 7 A. M., September 29th, adults found greatly swollen with blood from the mice. The latter still alive.

These experiments show clearly enough that *lectularius* will readily feed on mice, at least under the conditions in foregoing. It has now to be proven whether or not they can breed under such conditions. There appears to be no reason why they cannot, yet experiments are necessary to prove that they can. The writers have been unable to experiment in this direction because of the difficulty experienced in obtaining either eggs from confined adults, or very young nymphs from other sources.

It is hardly necessary to say that more experiments are needed on all points in the question involved.

II. *Clinocoris columbarius* (Jenyns).

As with *lectularius*, so with this species. The host relations are entirely unknown. That is, the statements concerning these relations are so confusing, that no positive conclusions are possible. The following preliminary experiments may help to a better understanding of them.

Thirty-two specimens, in all stages, were obtained on September 24th, 1905, from a chicken house, in a large fowl yard at Anacostia, D. C. The house in which they were found was a barn-like structure, consisting of an elevated first floor and a loft above. On the former, which consisted of a main hallway running the entire length of the building, and of pen-like rooms of rather large dimensions, on each side, made of closely fitting laths coated with whitewash, was occupied entirely by chickens. Each room contained about three nests, made of boxes filled with straw. The loft above was occupied by pigeons.

The first floor of the structure was reached from the ground by means of a stairway. The building itself was surrounded by quite extensive yards, all alive with different kinds of poultry and pigeons, and was not very distant from the dwelling of the superintendent.

The bugs were not easily found at first. In fact, none were found in the nests. The first sign of their presence was found in the spider nests along the walls, which sometimes held large masses of dead bugs and exuviae; generally, however, but one or two. Finally, the insects were found hiding in cracks between the laths, or in dark corners of the room; in such places, eggs were quite frequently found. Nearly all of them were full-fed, showing a constant supply of food at hand. They were in all stages, and it was quite difficult to dislodge them. The attendant, who was following, said that no bugs were present. But a casual observer would hardly have noticed their presence.

It struck the writers at once, that an excellent opportunity here offered to prove whether or not this species would naturally leave their preferred hosts, chickens, and go to the dwellings of man; or whether they would crawl onto man, thus be transferred to his dwellings, and breed there. But this could not be determined because of the absence of the superintendent, and nothing could be obtained from the attendant, who denied all knowledge of bugs, especially those found in beds.

This species found associated with chickens agrees well with the description of *columbarius* given by Osborn (1896), and they agree with supposed specimens of that species now in the collection of the United States National Museum. On comparison with other species in the National Museum collection, they are at once easily separated from the species associated with the bat (*pipistrelli* Jenyns), and with the swallow (*hirundinis* Jenyns). They are closer to *lectularius*, but differ in the shape of the body, which has the greatest width of the abdomen at the middle, and which, in general, is smaller, and in the relative lengths of joints 3 and 4 of the antennae, which are subequal in *columbarius*, but joint 3 much longer than 4 in *lectularius*. They cannot possibly be *Acanthia inordora* Dugès. The specimens in the National Museum are from the United States.

A. *Experiment with human blood.*

At 6.45 P. M., September 28th, an adult of this species, full-fed when captured, was placed into a small glass vial and the latter then inverted over a portion of the fore arm, just above the wrist. In this way, the insect was forced to rest on a portion of the skin.

Upon regaining its position, after the fall down the sides of the vial, it remained perfectly motionless for nearly a minute. Then, very quietly, it inserted the beak and began to feed. In ten minutes, it was gorged with blood, and the body was therefore much elongated. About eleven minutes after beginning to feed, the bug withdrew its beak, its body greatly distended with blood.

Another recently fed adult captured on September 24th, showed willingness to feed from the fingers of the hand on the afternoon of September 29th, when they were placed near it.

Accordingly, it was transferred to a vial, and the latter inverted over a portion of the under surface of the fore arm, at 6:08 P. M., in the presence of a bright light.

It tried to escape at first, but at 6:09 P. M., it inserted the beak and began to feed. The vial was then removed, leaving the insect attached to the arm. It was wholly unmindful of the light. The abdomen gradually commenced to swell, until at 6:16 P. M,, it was greatly distended, and cylindrical, apparently unable to hold more. Yet the insect remained attached until 6:18:15 P. M., when it withdrew the beak and began to run off. It now resembled a gravid termite female, all abdomen. At 6:20 P. M., it voided a drop of thick, dark, liquid excrement.

B. *Experiments with living mice.*

At 8 P. M., September 28th, three recently born mice were placed under a bell-jar, and three adults and two larvæ of *columbarius* added. They were left over night in a dark-room, and were found gorged with blood on the morning of September the 29th.

While placing them under the bell-jar the evening before, one of the adults accidently fell on the body of one of the young mice, which it immediately attacked. When its beak was inserted, the mouse jumped from the pain, and a struggle then ensued, the almost helpless little animal trying desperatively to dislodge the sucking insect by rolling and kicking. Several times, the bug lost its hold, but turned at once and renewed the attack, until at last, it obtained a position on the breast of the mouse, between the fore legs, where it was simply impossible for it to be reached. Here it fed until satisfied.

The insects showed no hesitancy in attacking these mice, after gaining access to them; but on account of the presence of light being necessary in order to watch them, they would not as a general rule, go at once to feed. Some do not seem to mind the light at all, however. This is seemingly dependent on the state of their appetite.

At 7.30 P. M., September the 29th, the experiment was repeated, using the same mice, now nearly exhausted from lack of nourishment. Two adults and one larva were left over night with the three mice. The following morning they were gorged with blood. The mice were dead.

Young mice are very sensitive to the attacks of these insects. They start with pain when bitten, and in their helpless way, struggle frantically to keep the insects away, or to dislodge them. But the activity and persistency of the "bed-bugs make their struggles useless."

The writers could not find any marked differences between *lectularius* and and *columbarius*, in their behavior towards the foregoing hosts. The former is perhaps, more bold and active than the latter.

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1898. Nuttall, George H. F. Zur Aufklärung der Rolle, welche stechende Insekten bei der Verbreitung von Infektionskrankheiten spielen. Infektionsversuche an Mäusen mittels mit Milzbrand, Hühnercholera und Mäuseseptikämie infiezierter Wanzen und Flöhe.

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The writers are indebted to Dr. L. O. Howard, Chief of the Bureau of Entomology, U. S. Department of Agriculture, for his kindness in permitting the publication of this paper.

RECENT ENTOMOLOGICAL LITERATURE

American Insects, BY VERNON L. KELLOGG, PROFESSOR OF ENTOMOLOGY AND LECTURER ON BIONOMICS IN LELAND STANFORD JR. UNIVERSITY, WITH MANY ORIGINAL ILLUSTRATIONS BY MARY WELLMAN. HENRY HOLT & COMPANY 1905. 674 pages, 812 figures and 13 colored plates.

This work easily ranks as the most comprehensive volume treating of American insects yet produced. The great progress in entomology during the decade which has elapsed since the appearance of Comstock's Manual, has enabled the author to give more adequate treatment to the dragon flies, to the previously almost unknown Culicidae and to the part taken by insects in the transmission of diseases. This latter, comprising an entire chapter, is a new and exceedingly important addition to a comprehensive work on American insects. There is a general systematic account of all the principal groups with special discussions of insect structure, physiology, development, metamorphosis and ecology, portions of which have been greatly enriched by the author's personal investigations. The systematic part agrees largely with Comstock except that the Coleopteras Diptera and Lepidoptera are treated in the order named. The synoptic key, have been summarized in certain groups and in others there are valuable additions, particularly in the Odonata and Orthoptera. The treatment of the Coleoptera, considering the importance and popularity of the group, appears rather brief in comparison with the space usually accorded this order in other works. Considerable attention is devoted to the economic aspects of the subject and a decided preference for the more injurious forms is exhibited in discussing typical species of the various groups considered. A very large majority of our more destructive insects are noticed, with a summarized statement of the life history and directions for controlling these pests. The interesting problems presented by social communities such as white ants, true ants and bees receive considerable attention. The important relationship existing between insects and flowers, the value of color and pattern and their uses, are discussed somewhat fully in two philosophic and very suggestive chapters. The work closes with an appendix on collecting and rearing insects.

The subject matter is presented in an easy narrative style, though accuracy is not sacrificed for the sake of popularity. The work itself is plainly printed on excellent paper and the illustrations are generally of a high standard. The volume exhibits a thorough appreciation of and familiarity with recent investigations and, considering the immense field covered, it is not surprising that there should be a few typographical and other errors and some minor inconsistencies. This work brings together in one volume a vast amount of information and the author is to be congratulated upon having produced a very readable comprehensive work, which should prove attractive and exceedingly helpful to the amateur as well as essential to every investigator. E. P. F.

A Catalogue of the Erycinidae, WITH THE SYNONYMY BROUGHT DOWN TO OCTOBER, 1904, BY LEVI W. MENGEL, READING, PENN. PUBLISHED MAY, 1905.

This publication covering the Erycinidae of the world is of undoubted value to every collector working in this family. It will serve as a collection check book and also as a catalogue of reference. The amount of work involved in its preparation is little appreciated by the average collector, but is readily appreciated by scientists who have attempted any such complete record of specific names with reference to previous publications. The author states in his preface that the arrangement of any such publication in connection with family or generic succession is dependent upon the ideas of the scientist who takes up the work; that is, there are scarcely any two publications of this sort that agree in family or generic arrangement, and the arrangement that is followed by the average collector is one that has been suggested through publications which were readily purchasable; thus the order of Mr. Kirby's synonymic catalogue has been widely adopted, although others have published works not so readily obtainable with a totally different arrangement.

The specific arrangement of any such publication should not be put under too severe criticism. This publication of 161 pages represents an amount of detailed work that is not readily realized, and it is a volume which should be in the possession of every library and of every collector who is interested in this branch of entomological work. A. G. W.

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